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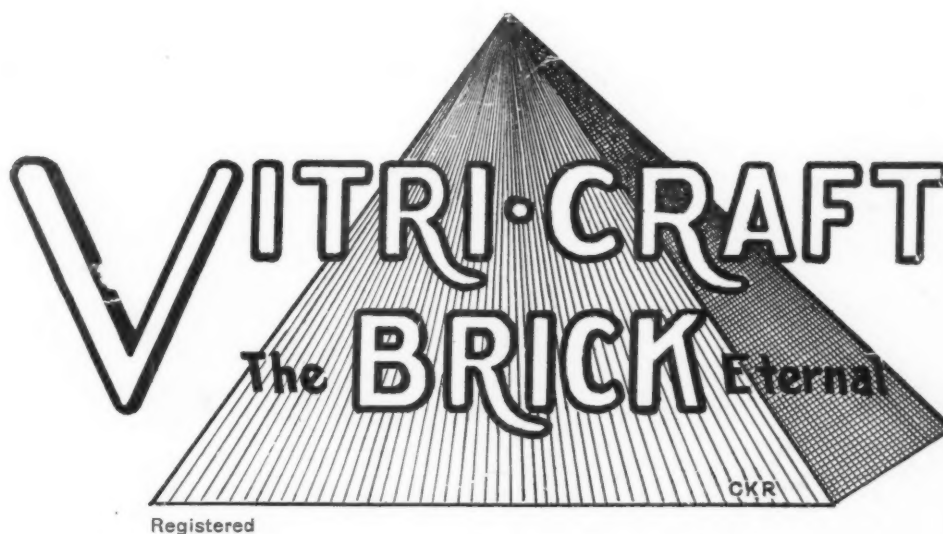
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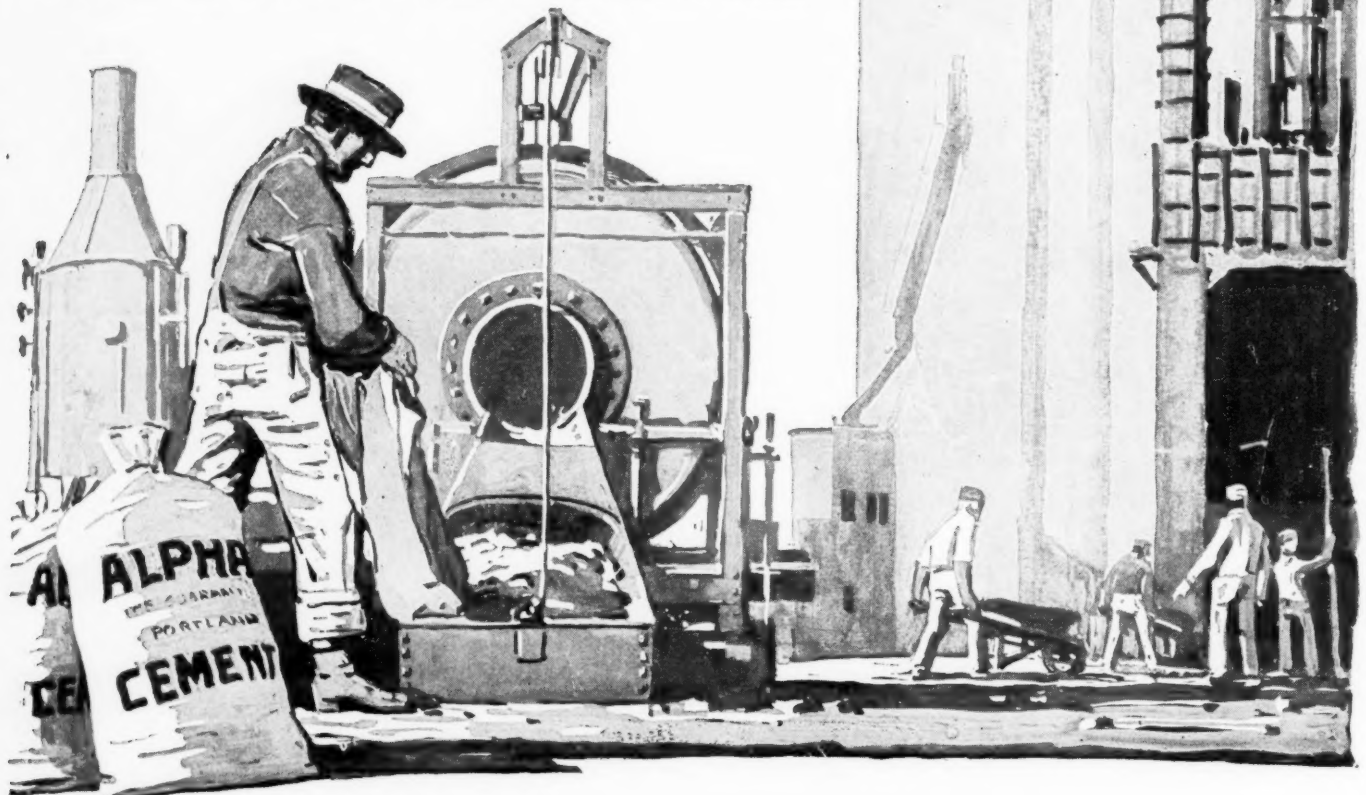
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Municipal Journal

Volume XLII

NEW YORK, JANUARY 11, 1917

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TESTING REINFORCED CONCRETE PIPE AT BOULDER

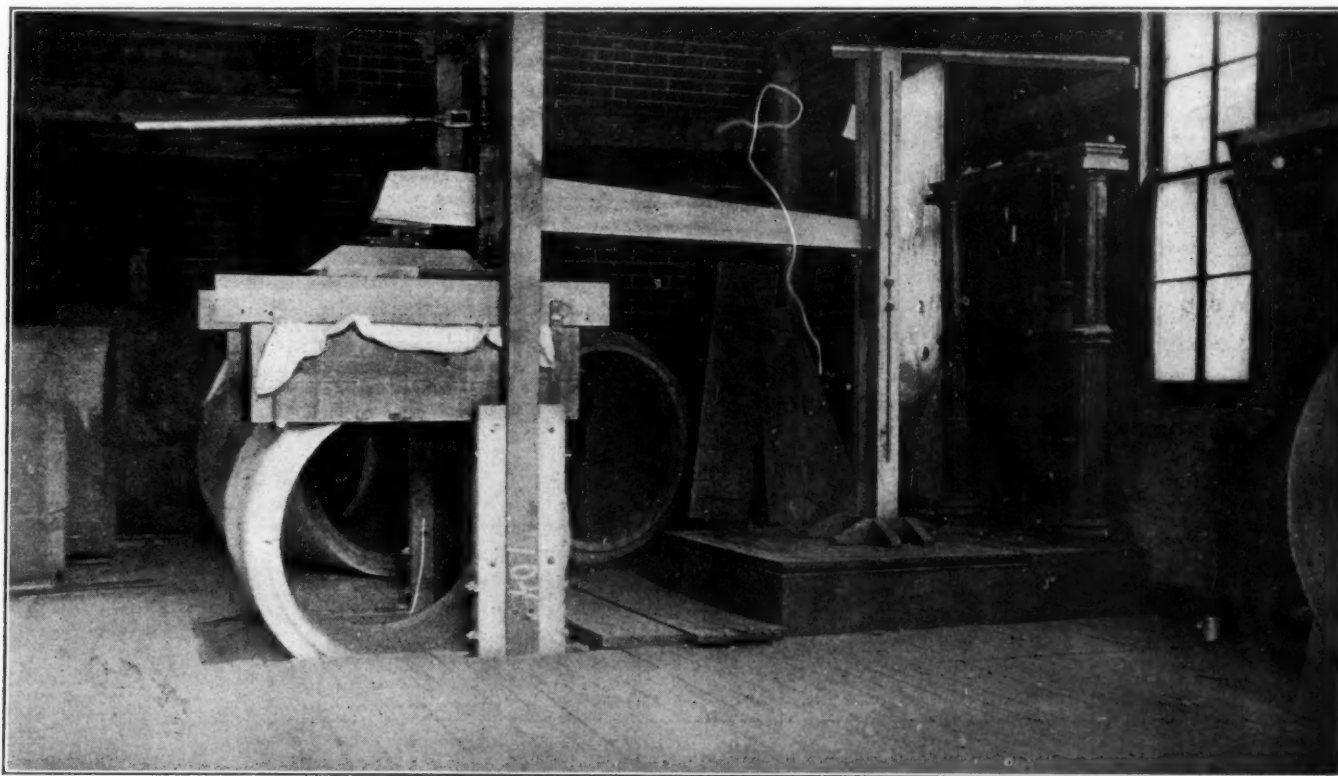
Systematic Testing Adopted After Failure of Untested, Poorly Made Pipe in the Trench—Specifications Relative to Tests—Machinery and Methods—Some Results—Cost of Making Tests.

By GEO. R. JOSLYN.*

While the amount of storm sewer construction in Boulder, Colo., has been somewhat limited, the results have been rather varied and have taught us a few lessons that might also be of some benefit to other cities.

Our first storm sewer was started in the year 1913. It consisted of a 36-inch concrete pipe, $3\frac{3}{4}$ inches thick, made in two-foot lengths, each length reinforced with three galvanized wire hoops 3-16 of an inch in diameter. After 80 or 90 feet of this pipe had been laid and the trench partially backfilled it was discovered that the pipe

by the city council to lay in its stead a 24-inch vitrified clay pipe, on a grade approximately two feet higher, which was done. In the spring of 1915 it was found that about eighty feet of the 24-inch pipe had cracked. This was no doubt partially caused by the extraordinary width of the backfill, due to the pipe having been placed in the trench which had been originally dug for the 36-inch pipe. Tests on some of the 24-inch pipe from this same shipment were recently made by the writer and showed that the pipe did not have sufficient strength



TESTING STORM SEWER PIPE, BOULDER, COLORADO, 1916.

was cracking. The sewer had only about five feet of gravel cover at this time, which had been soaked with water to hasten its settling. A test was then made at the State University on two lengths of the pipe which had not been used, and the results showed that the pipe was very weak, probably due to the poor materials used in the concrete. These pipes were also very porous and would not hold water for any length of time. This pipe was therefore discarded and the city engineer was instructed

*Formerly city engineer of Boulder, Col.

to sustain the seven feet of backfill. This stretch of storm sewer was finally constructed of 24-inch cast iron pipe, which no doubt will last for some time. The experiences on this sewer seemed to indicate the necessity of adopting a standard of some kind and actually testing the pipe to make it conform to the standard.

The Standard Adopted.—Accordingly, after some research we decided to use the Iowa Standard Specifications for Testing Drain Tile and Sewer Pipe as drawn up by Prof. A. Marston of the Engineering Experiment

Station at Ames, Iowa, and published in Bulletin No. 31 of that Station. An Ames senior testing machine, for testing the bearing strength of sewer pipe according to these specifications, was purchased and installed.

In March, 1916, the city received bids for the construction of approximately 2,150 feet of storm sewer, under two plans—one for reinforced concrete pipe, and the other for vitrified clay pipe. The bid of the Gordon & Taylor Construction Company of Denver, on the concrete pipe, was the lowest, and this company was awarded the contract.



VIEW OF PIPE YARD IN BOULDER, COLO.

The Specifications.—The specifications for this work indicated the character and quality of the materials that should be used in the concrete pipe, but did not specify the proportions in which they should be mixed. This and the amount of reinforcement to be used in the pipe were left to the discretion of the contractor. The engineer was to select at least five representative pipe of each size and subject the same to the tests called for in the Iowa Standard Specifications. The pipe were required to show a specified minimum average bearing strength, depending upon the size, before they could be used in the work at all.

The specifications contained a table, prepared by Prof. Marston, giving the ordinary maximum loads on sewer pipe in ditches caused by common ditch filling materials,

The depth of sand above and below the pipe at the thinnest points was at each place equal to one-fourth the diameter of the pipe, measured between the middle lines of the pipe walls. The top bearing frame was not allowed to come in contact with the pipe nor with the test load, and the test load was applied at the exact center on the top bearing by the use of four rollers placed at right angles, leaving the bearing free to move in any direction. The test load was applied gradually and continuously by means of the jack-screw and the amount of the applied load was determined by multiplying the weight registered on the platform scales by the ratio of the lever arm. The total breaking load was equal to the total top load, including the applied load, the weight of the top frame, sand for top bearing, top bearing timbers, etc., plus five-eighths of the weight of the pipe. This total load was divided by the length of the pipe in feet, so as to give the bearing strength per lineal foot.

To determine the average percent of absorption, five specimens approximately three inches square and extending the full thickness of the pipe wall were thoroughly dried to remove all moisture, and brushed to remove all dust and loose particles. They were then weighed very accurately and completely immersed in pure water for a period of twenty-four hours. They were then removed, the surplus water absorbed with a soft cloth, and reweighed. The result was calculated by taking the difference between the initial weight and the final weight, and dividing by the initial dry weight, and the average of the five individual specimens was determined.

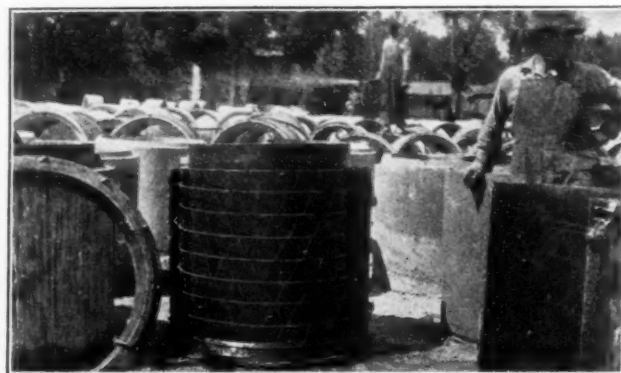
The Results of the Tests.—The results shown in the table are an average of all the tests on each size of pipe, but in very few cases did an individual test fall below the requirements. It might be well to add that the average bearing strengths given in the table indicate the load at which the concrete showed cracks, except in the case of the 42-inch pipe, where it was impossible to crack the pipe with this testing machine. These figures, then, could be used to determine the modulus of rupture of the pipe, but do not indicate the load under which the pipe would

DATA ON REINFORCED CONCRETE STORM SEWER PIPE—BOULDER, COLORADO.

Inside diameter of pipe.	Thickness of pipe wall.	Length per section.	Reinforcement, No.	Average weight per section.	Aver. bearing strength per lin. ft.	Required bearing strength per lin. ft.	Actual per cent. absorption.	Maximum allowable absorption.	Number of feet laid.	Cost per lin. ft. in place.
24"	3"	3'	25	637 lbs.	3,125 lbs.	3,100 lbs.	3.49%	6.00%	347'	\$2.65
33"	4"	3'	24	1,254 lbs.	4,261 lbs.	4,150 lbs.	3.33%	6.00%	378'	\$4.55
36"	4 1/2"	3'	24	1,485 lbs.	5,420 lbs.	5,035 lbs.	3.23%	6.00%	369'	\$5.20
42"	5"	3'	23	2,020 lbs.	5,685 lbs.	5,400 lbs.	3.27%	6.00%	1,020'	\$5.95

for various widths of trench and depths of fill. Any pipe which showed an average bearing strength less than 165 per cent of the load indicated in this table, but which had a bearing strength equal to the minimum mentioned above, was to be bedded in a concrete cradle up to a level 15° of the pipe circumference above the mid-height. The dimensions and proportions of the concrete cradle were specified for both solid and yielding soils. All of the pipe tested on this job, however, proved to be sufficiently strong, as shown in the accompanying table, and no concrete cradle was necessary.

How the Tests Were Made.—A brief description of the methods used in making these tests will be given here. The pipes selected for the tests (which were carefully picked out to represent fairly the quality of pipe furnished by the contractor for use on the job) were weighed after being kept in a dry room for two days. Each pipe was then marked with crayon into quarters and placed in the testing machine so as to be carefully bedded, above and below, in sand for one-fourth the circumference of the pipe, measured on the middle line of the pipe wall.



MAKING REINFORCED CONCRETE PIPE IN BOULDER, COLO., IN 1916.

collapse, for the reinforcement would undoubtedly sustain a greater load. The testing apparatus was not strong enough to cause a complete failure in any of these pipe.

Cost of Testing Pipe.—The testing machine has cost, up to date, \$78.15, which includes the cost of the 3,000-pound platform scales and all the alterations necessary to handle the large size pipe. The total labor cost of installing and remodeling the machine and the time necessary to make the tests was \$177.58. This would bring the cost of testing for the whole job to \$255.73, or about 12c. per lineal foot of sewer. The cost of testing will, of course, be less on future work and will depend somewhat on the size of the job as well as on the size of the pipe itself.

The city of Boulder would have saved about \$750 on the first 84 feet of storm sewer laid, had they been equipped to test the pipe before it was used instead of testing it after it had been laid.

Other Particulars of the Work.—The furnishing of the pipe for the storm sewers recently completed was sublet to the Reinforced Concrete Pipe Company of Chicago. Washed sand and pea-gravel were shipped 35 miles to the pipe yard, and each carload of cement was tested before being used. The concrete was mixed rather wet and consisted of one part cement, two parts sand and three parts pea-gravel. Each pipe was reinforced with one strip of triangular mesh wire (manufactured by the American Steel and Wire Co.), which was placed in an elliptical position in the pipe.

The pipes were kept wet and allowed to cure for at least 15 days, and were then hauled to the trench on a low-bed wagon.

Although the ground contained considerable large boulders, the contractor succeeded in using a Buckeye traction ditcher which excavated a large portion of the trenches.

Care was taken to keep all large stones at least twelve inches from the pipe when backfilling, and to tamp fine material between the pipe and the sides of the trench, so as to take as much strain as possible off of the pipe. The backfilling was done by hand until the trench was filled about one foot above the top of the pipe, and the remainder was filled with a power backfiller No. 8, manufactured by the F. C. Austin Co.

APPARATUS FOR TESTING CONCRETE PIPE

Home-Made Apparatus for Testing Strength and Deflection Under Load of Reinforced Concrete Pipe in West Allis.

By E. G. ORBERT.*

It is frequently desirable to test the strength of large size concrete sewer pipe, but owing to the absence of suitable testing machines the engineer is usually limited to a simple loading test, which, although satisfactory to a certain extent, in so far as it determines the load which the pipe will safely carry, yet does not give any definite information as to the actual effect on the pipe. In other

*City engineer of West Allis, Wis.

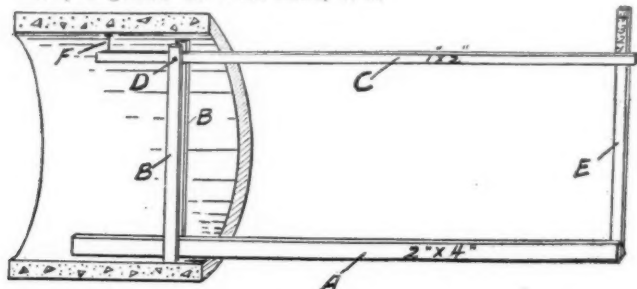
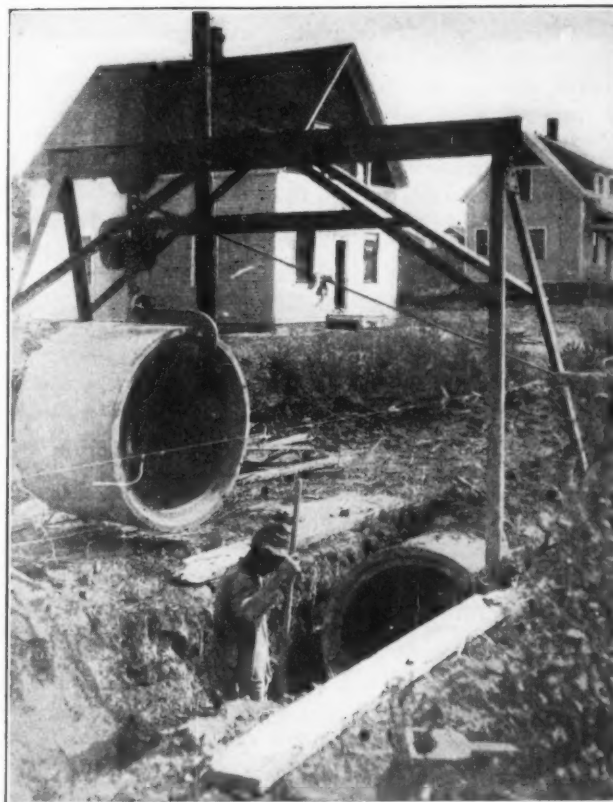


FIG. 1. APPARATUS FOR MEASURING DEFLECTION.



LAYING PIPE IN SHALLOW CUT, WEST ALLIS.

words, unless the pipe under test is resting on an absolutely rigid foundation, it is a difficult matter to determine with any degree of accuracy the deflection caused by the load during its application.

In conducting a test on some 42-inch reinforced concrete pipe for a storm sewer at West Allis, Wis., the writer used a simple apparatus which can be constructed in a few minutes from odds and ends of lumber at hand.

In the accompanying drawing (Fig. 1) showing the construction, *A* is a piece of 2 by 4-inch joist about 10 feet long and forms the foundation piece of the apparatus. *BB* are two boards nailed flatwise against *A* and at right angles to it. *C* is a light movable arm turning freely on the bolt *D*, which passes through the uprights *BB* and the arm. The upright piece *E* has a scale marked upon the side next to the movable arm to register the deflection. The spike *F* driven into the short arm of *C* rests against the crown of the pipe, and as the short arm of *C* is made one foot long and the long arm eight feet, the movement at the scale end is eight times the deflection of the pipe. Therefore if the scale divisions are each made $\frac{1}{2}$ inch, a movement of one graduation indicates a deflection of one-sixteenth of an inch.

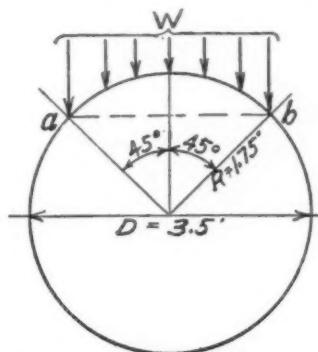


FIG. 2. DISTRIBUTION OF LOAD ON PIPE.

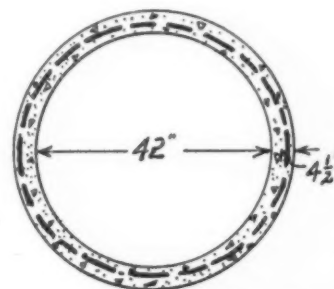


FIG. 3. SECTION SHOWING ELLIPTICAL POSITION OF REINFORCEMENT.

In making the test the pipe was firmly bedded in the ground to a depth equal to one-half its diameter and a narrow trench dug to receive the piece *A*, clear of all obstructions, in order to obviate any interference with the recording device due to a possible settlement of the pipe during the application of the load.

The specifications required that $W = 5,000 \text{ RL}$.

In which W equals the total load in pounds carried without deflection.

In which R equals the radius of the pipe in feet.

In which L equals the length of the section loaded, in feet.

Or, in other words, 2,500 pounds per square foot of horizontal area of the pipe. The load was to be applied, however, on a 90 degree segment, 45 degrees on either side of the vertical center line. From the following simple computation it will be seen that the actual weight carried is approximately 3,500 pounds per square foot for the area loaded.

Referring to Fig. 2, $ab = d \sin. 45 \text{ deg.} = 2.475 \text{ feet}$. For one lineal foot of pipe the load will be $5,000 R$, or 8,750 pounds. Or the load per square foot of horizontal projection of the 90 deg. segment equals $5,000 R \div ab = 3,535 \text{ lbs. per sq. ft.}$

The pipe was built of clean crushed stone and Waukesha washed sand, with a single layer of American Steel and Wire Company's triangle mesh reinforcing weighing .70 lbs. per sq. ft. and placed elliptically as illustrated in Fig. 3.

A section of pipe three feet long was placed as previously described and a saddle constructed by simply chaining the ends of two railroad ties together in such a manner as to subtend an arc of 90 degrees between their outer edges. Bags of sand weighing 100 pounds each were then piled on the pipe between and over the ties, care being taken to distribute the weight evenly.

The total load required by the specifications, as above noted, for this pipe would equal $5,000 \times 1.75 \times 3$, or 26,500

lbs. Accordingly 265 bags of sand, or 26,500 lbs., were applied, exclusive of the weight of the saddle, etc., which would add several hundred pounds more.

During the entire process of loading, absolutely no deflection could be detected by means of the scale beam. The load was not removed for twelve hours, and at the end of that time the same condition was noted, neither deflection nor cracks having developed.

It is to be regretted that the test was not continued to failure, as it seems probable, from the absence of the slightest signs of distress, that a much greater load could have been applied without collapse of the pipe. However, the test as conducted shows, in a large measure at least, the highly satisfactory results to be obtained with reinforced concrete pipe when well made with proper materials.

The cost of the completed sewer was only \$3.59 per ft. The average cut was 6 to 8 feet.

The contract was executed by the Public Service Construction Co. of Omaha, Neb., and the pipe was made by the Chicago Reinforced Concrete Pipe Co. The entire work was under the supervision of the writer.

ROAD ACCOUNTANCY

System Used by Engineer of Garfield County, Washington—Designations Assigned to Roads and Bridges—Forms for Monthly Reports.

By R. W. RIGSBY, County Engineer.

Some three years ago the commissioners of Garfield county (Washington) adopted a resolution in which the engineer's office was designated the fit and logical place for the development of a system of road accountancy. The intention was to determine the comparative mileage cost for maintenance of roads and construction of new roads in the several districts and to go far enough into detail so that should any material discrepancy arise the cause could be easily detected. It was the intention also to open to the public an accurate record of detailed expenditures for maintenance and construction of roads so that an intelligent criticism could be made and the responsibility fixed. In passing this resolution the commissioners took a forward step in the management of road affairs, and I believe the final result will be the establishment of a new system of road maintenance which will correct inefficiency in the present method.

Upon the passage of this resolution the county engineer, assisted by the county accountant, worked out the details of a system of accountancy which would cover the business of road construction and maintenance. This system has been carefully kept, with such variations as were necessary to fit the conditions in hand and the data furnished are authentic and convenient. An exposition of the system follows:

The road mileage of each district was carefully measured, and the customary camping places of the supervisor or his general repair work were numbered. Section No. 1 is the camping place where the supervisor usually starts his repair work of the spring, and the successive numbers follow the usual route taken by the supervisor in covering the road mileage of his district. The section numbers and locations having been chosen, the roads radiating from each camping place for a distance usually and consistently worked from that camp are designated and mileage given. Bridges are numbered and culverts are designated by giving their location on any particular section of road. Each supervisor is given a blue print of his district showing the details above described and from



FIGURE 3—LOADING WITH SAND

which he is enabled to make an intelligent and well localized report to the engineer at the end of each month.

The equipment of the supervisor consists of the usual tools used in the ordinary maintenance and construction of roads, and in addition this county boards the men and teams, thus making a cookhouse, a bunkhouse and a feed rack necessary parts of the equipment. The supervisor is responsible for the care of the equipment, and the engineer at the first of each year (and sometimes at the end of the spring working season) takes a careful inventory to determine depreciation on account of wear or otherwise.

The funds to be used by the supervisor are determined at the time of making the appropriation. The several amounts to be used for special construction work are designated separately, and the amounts for repair are distributed to the different camps in proportion to the mileage. Appropriations are made for equipment and other items of expense in each district, thus making the funds conform to a budget system.

In the above exposition I have given the basis upon which is built our present system of road accountancy. The supervisor, armed with the equipment and details relative to his district, makes his report to the engineer at the end of each month on the following report blanks: Individual labor report, cookhouse report, feedyard report, bridge material report and equipment report. These reports are made in duplicate, the supervisor retaining a copy for reference.

The individual labor report and bridge material report are made up in such a way that the amount and class of labor may be given and localized. Cookhouse, feedyard, equipment and bridge material reports take care of items purchased, costs and name of person or firm making sale.

These reports are made out by the supervisor and form the basis for the checking of claims for labor or material, all of which claims pass through the engineer's office for auditing. When all claims have been audited for the month the several reports are entered in a segregation book as follows:

The individual labor reports are segregated and distributed among the various sections and sub-sections as reported. Cookhouse and feedyard for the month are prorated against the respective amounts of labor performed by men and teams. Bridge material is distributed among the sections and sub-sections as reported and equipment used is noted in a column by itself.

The monthly reports thus obtained and segregated are entered in a ledger against the several sections and subsections of the district. At the end of the year the totals are brought down and the depreciation in the equipment, obtained by taking the difference in the estimated value of the equipment at the end of the year and the estimated value at the beginning of the year plus amount bought, is prorated against the several sections and sub-sections in proportion to the cost of labor done.

This gives at the end of the year a thorough report on the cost of maintenance and construction and, in addition to being valuable data, it has been the means of saving this county much, both in the accurate check given all claims and also in the purchase of materials and the systematic arrangement of the work in connection with the roads.

The several reports have the following column headings:

Supervisor's Monthly Report, Bridge Material—Date; From whom and what purchased, amount; Date; How accounted for, amount.

Tools and Machinery—Same as above. Cookhouse Supplies—Same as above. Feedyard Supplies—Same as above.

Supervisor's Labor Report, Individual—Name of employee, month and year, name of supervisor; Bridge or section; Nature of work; 1, 2, 3 (a column for each day); No. of hours; Rate; Amount. This is checked and signed by the county engineer, and the supervisor signs the statement: "I hereby certify on honor that the foregoing report is just, true and correct; that the person whose name appears thereon actually performed the labor as stated, on the dates shown, and that the amounts are actually true as stated."

POPULARIZING PURIFICATION PLANTS

How Grand Rapids Dispels Popular Prejudice Against Use of Chemicals in Water Purification Plant—Use of Models and Charts.

By CHESTER W. SHAFER.

The problem of educating the public to the concrete values of filtered water and thereby dispelling the prejudice that is common in most cities against a municipal filtration plant has been the object of study by L. D. Cutcheon, the manager of the million-dollar water plant at Grand Rapids, Mich. In the course of his study he has evolved a plan which, by explaining lucidly all the details of the plant operation that, unexplained, would have a tendency to induce suspicion and prejudice, has created in the minds of the public a realization of the injustice and falsity of adverse prejudice. Since the installation of the plant several years ago the "kicks" and complaints reaching the offices of the Board of Works have diminished from a substantial daily number to an average of one a month, and the general cry or protest

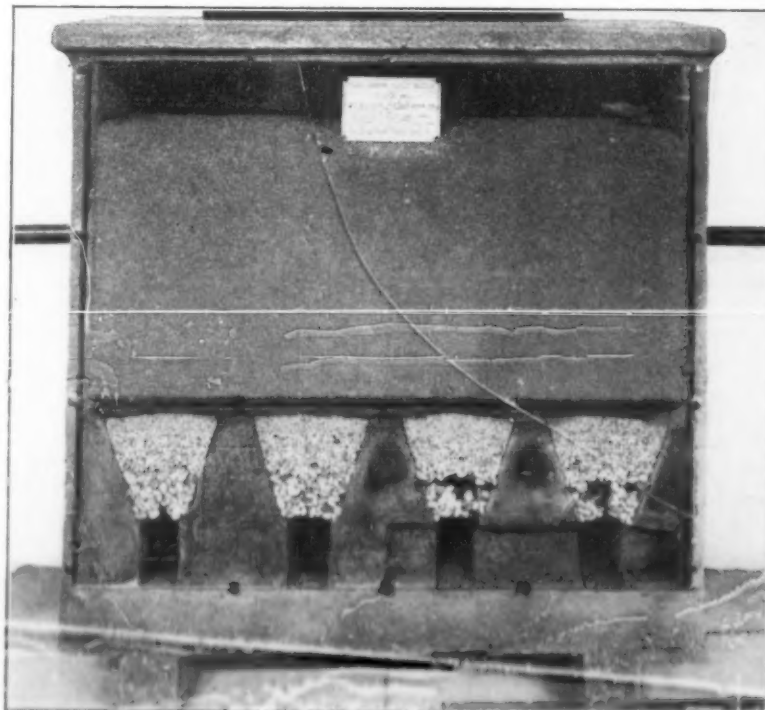


FIG. 2. MODEL OF A SECTION OF FILTER.

Station at Ames, Iowa, and published in Bulletin No. 31 of that Station. An Ames senior testing machine, for testing the bearing strength of sewer pipe according to these specifications, was purchased and installed.

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VIEW OF PIPE YARD IN BOULDER, COLO.

The Specifications.—The specifications for this work indicated the character and quality of the materials that should be used in the concrete pipe, but did not specify the proportions in which they should be mixed. This and the amount of reinforcement to be used in the pipe were left to the discretion of the contractor. The engineer was to select at least five representative pipe of each size and subject the same to the tests called for in the Iowa Standard Specifications. The pipe were required to show a specified minimum average bearing strength, depending upon the size, before they could be used in the work at all.

The specifications contained a table, prepared by Prof. Marston, giving the ordinary maximum loads on sewer pipe in ditches caused by common ditch filling materials,

The depth of sand above and below the pipe at the thinnest points was at each place equal to one-fourth the diameter of the pipe, measured between the middle lines of the pipe walls. The top bearing frame was not allowed to come in contact with the pipe nor with the test load, and the test load was applied at the exact center on the top bearing by the use of four rollers placed at right angles, leaving the bearing free to move in any direction. The test load was applied gradually and continuously by means of the jack-screw and the amount of the applied load was determined by multiplying the weight registered on the platform scales by the ratio of the lever arm. The total breaking load was equal to the total top load, including the applied load, the weight of the top frame, sand for top bearing, top bearing timbers, etc., plus five-eighths of the weight of the pipe. This total load was divided by the length of the pipe in feet, so as to give the bearing strength per lineal foot.

To determine the average percent of absorption, five specimens approximately three inches square and extending the full thickness of the pipe wall were thoroughly dried to remove all moisture, and brushed to remove all dust and loose particles. They were then weighed very accurately and completely immersed in pure water for a period of twenty-four hours. They were then removed, the surplus water absorbed with a soft cloth, and reweighed. The result was calculated by taking the difference between the initial weight and the final weight, and dividing by the initial dry weight, and the average of the five individual specimens was determined.

The Results of the Tests.—The results shown in the table are an average of all the tests on each size of pipe, but in very few cases did an individual test fall below the requirements. It might be well to add that the average bearing strengths given in the table indicate the load at which the concrete showed cracks, except in the case of the 42-inch pipe, where it was impossible to crack the pipe with this testing machine. These figures, then, could be used to determine the modulus of rupture of the pipe, but do not indicate the load under which the pipe would

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Inside diameter of pipe.	Thickness of pipe wall.	Length per section.	Reinforcement.	Average weight per section.	Average bearing strength per lin. ft.	Required bearing strength per lin. ft.	Actual per cent. absorption.	Maximum allowable % absorption.	Number of feet laid.	Cost per lin. ft. in place.
18"	4"	10'	No. 8	837 lbs.	1,125 lbs.	1,100 lbs.	3.49%	6.00%	347'	\$2.65
24"	4"	10'	No. 10	1,354 lbs.	1,541 lbs.	1,550 lbs.	3.33%	6.00%	378'	\$4.55
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MAKING REINFORCED CONCRETE PIPE IN BOULDER, COLO., IN 1916.

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The pipes were kept wet and allowed to cure for at least 15 days, and were then hauled to the trench on a low-bed wagon.

Although the ground contained considerable large boulders, the contractor succeeded in using a Buckeye traction ditcher which excavated a large portion of the trenches.

Care was taken to keep all large stones at least twelve inches from the pipe when backfilling, and to tamp fine material between the pipe and the sides of the trench, so as to take as much strain as possible off of the pipe. The backfilling was done by hand until the trench was filled about one foot above the top of the pipe, and the remainder was filled with a power backfiller No. 8, manufactured by the F. C. Austin Co.

APPARATUS FOR TESTING CONCRETE PIPE

Home-Made Apparatus for Testing Strength and Deflection Under Load of Reinforced Concrete Pipe in West Allis.

By E. G. ORBERT.*

It is frequently desirable to test the strength of large size concrete sewer pipe, but owing to the absence of suitable testing machines the engineer is usually limited to a simple loading test, which, although satisfactory to a certain extent, in so far as it determines the load which the pipe will safely carry, yet does not give any definite information as to the actual effect on the pipe. In other

*City engineer of West Allis, Wis.

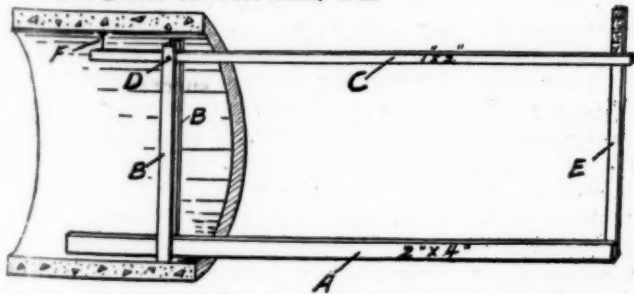


FIG. 1. APPARATUS FOR MEASURING DEFLECTION.



LAYING PIPE IN SHALLOW CUT, WEST ALLIS.

words, unless the pipe under test is resting on an absolutely rigid foundation, it is a difficult matter to determine with any degree of accuracy the deflection caused by the load during its application.

In conducting a test on some 42-inch reinforced concrete pipe for a storm sewer at West Allis, Wis., the writer used a simple apparatus which can be constructed in a few minutes from odds and ends of lumber at hand.

In the accompanying drawing (Fig. 1) showing the construction, *A* is a piece of 2 by 4-inch joist about 10 feet long and forms the foundation piece of the apparatus. *BB* are two boards nailed flatwise against *A* and at right angles to it. *C* is a light movable arm turning freely on the bolt *D*, which passes through the uprights *BB* and the arm. The upright piece *E* has a scale marked upon the side next to the movable arm to register the deflection. The spike *F* driven into the short arm of *C* rests against the crown of the pipe, and as the short arm of *C* is made one foot long and the long arm eight feet, the movement at the scale end is eight times the deflection of the pipe. Therefore if the scale divisions are each made $\frac{1}{2}$ inch, a movement of one graduation indicates a deflection of one-sixteenth of an inch.

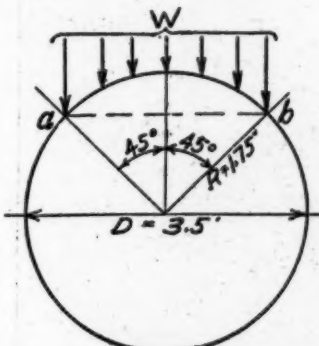


FIG. 2. DISTRIBUTION OF LOAD ON PIPE.

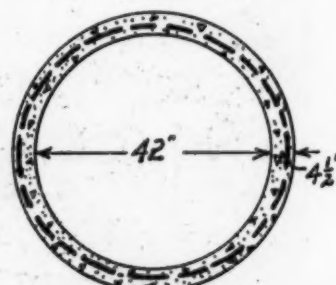


FIG. 3. SECTION SHOWING ELLIPTICAL POSITION OF REINFORCEMENT.

In making the test the pipe was firmly bedded in the ground to a depth equal to one-half its diameter and a narrow trench dug to receive the piece *A*, clear of all obstructions, in order to obviate any interference with the recording device due to a possible settlement of the pipe during the application of the load.

The specifications required that $W = 5,000 \text{ RL}$.

In which *W* equals the total load in pounds carried without deflection.

In which *R* equals the radius of the pipe in feet.

In which *L* equals the length of the section loaded, in feet.

Or, in other words, 2,500 pounds per square foot of horizontal area of the pipe. The load was to be applied, however, on a 90 degree segment, 45 degrees on either side of the vertical center line. From the following simple computation it will be seen that the actual weight carried is approximately 3,500 pounds per square foot for the area loaded.

Referring to Fig. 2, $ab = d \sin. 45 \text{ deg.} = 2.475 \text{ feet}$. For one lineal foot of pipe the load will be $5,000 \text{ R}$, or 8,750 pounds. Or the load per square foot of horizontal projection of the 90 deg. segment equals $5,000 \text{ R} \div ab = 3,535 \text{ lbs. per sq. ft.}$

The pipe was built of clean crushed stone and Waukesha washed sand, with a single layer of American Steel and Wire Company's triangle mesh reinforcing weighing .70 lbs. per sq. ft. and placed elliptically as illustrated in Fig. 3.

A section of pipe three feet long was placed as previously described and a saddle constructed by simply chaining the ends of two railroad ties together in such a manner as to subtend an arc of 90 degrees between their outer edges. Bags of sand weighing 100 pounds each were then piled on the pipe between and over the ties, care being taken to distribute the weight evenly.

The total load required by the specifications, as above noted, for this pipe would equal $5,000 \times 1.75 \times 3$, or 26,500

lbs. Accordingly 265 bags of sand, or 26,500 lbs., were applied, exclusive of the weight of the saddle, etc., which would add several hundred pounds more.

During the entire process of loading, absolutely no deflection could be detected by means of the scale beam. The load was not removed for twelve hours, and at the end of that time the same condition was noted, neither deflection nor cracks having developed.

It is to be regretted that the test was not continued to failure, as it seems probable, from the absence of the slightest signs of distress, that a much greater load could have been applied without collapse of the pipe. However, the test as conducted shows, in a large measure at least, the highly satisfactory results to be obtained with reinforced concrete pipe when well made with proper materials.

The cost of the completed sewer was only \$3.59 per ft. The average cut was 6 to 8 feet.

The contract was executed by the Public Service Construction Co. of Omaha, Neb., and the pipe was made by the Chicago Reinforced Concrete Pipe Co. The entire work was under the supervision of the writer.

ROAD ACCOUNTANCY

System Used by Engineer of Garfield County, Washington—Designations Assigned to Roads and Bridges—Forms for Monthly Reports.

By R. W. RIGSBY, County Engineer.

Some three years ago the commissioners of Garfield county (Washington) adopted a resolution in which the engineer's office was designated the fit and logical place for the development of a system of road accountancy. The intention was to determine the comparative mileage cost for maintenance of roads and construction of new roads in the several districts and to go far enough into detail so that should any material discrepancy arise the cause could be easily detected. It was the intention also to open to the public an accurate record of detailed expenditures for maintenance and construction of roads so that an intelligent criticism could be made and the responsibility fixed. In passing this resolution the commissioners took a forward step in the management of road affairs, and I believe the final result will be the establishment of a new system of road maintenance which will correct inefficiency in the present method.

Upon the passage of this resolution the county engineer, assisted by the county accountant, worked out the details of a system of accountancy which would cover the business of road construction and maintenance. This system has been carefully kept, with such variations as were necessary to fit the conditions in hand and the data furnished are authentic and convenient. An exposition of the system follows:

The road mileage of each district was carefully measured, and the customary camping places of the supervisor in his general repair work were numbered. Section No. 1 is the camping place where the supervisor usually starts his repair work of the spring, and the successive numbers follow the usual course taken by the supervisor in covering the road mileage of his district. The section numbers and locations having been chosen, the roads radiating from each camping place for a distance usually and conveniently worked from that camp are designated and mileage given. Bridges are numbered and culverts are designated by giving their location on any particular section of road. Each supervisor is given a blue print of his district showing the details above described and from



TESTING 42-INCH PIPE FOR DEFLECTION.

which he is enabled to make an intelligent and well localized report to the engineer at the end of each month.

The equipment of the supervisor consists of the usual tools used in the ordinary maintenance and construction of roads, and in addition this county boards the men and teams, thus making a cookhouse, a bunkhouse and a feed rack necessary parts of the equipment. The supervisor is responsible for the care of the equipment, and the engineer at the first of each year (and sometimes at the end of the spring working season) takes a careful inventory to determine depreciation on account of wear or otherwise.

The funds to be used by the supervisor are determined at the time of making the appropriation. The several amounts to be used for special construction work are designated separately, and the amounts for repair are distributed to the different camps in proportion to the mileage. Appropriations are made for equipment and other items of expense in each district, thus making the funds conform to a budget system.

In the above exposition I have given the basis upon which is built our present system of road accountancy. The supervisor, armed with the equipment and details relative to his district, makes his report to the engineer at the end of each month on the following report blanks: Individual labor report, cookhouse report, feedyard report, bridge material report and equipment report. These reports are made in duplicate, the supervisor retaining a copy for reference.

The individual labor report and bridge material report are made up in such a way that the amount and class of labor may be given and localized. Cookhouse, feedyard, equipment and bridge material reports take care of items purchased, costs and name of person or firm making sale.

These reports are made out by the supervisor and form the basis for the checking of claims for labor or material, all of which claims pass through the engineer's office for auditing. When all claims have been audited for the month the several reports are entered in a segregation book as follows:

The individual labor reports are segregated and distributed among the various sections and sub-sections as reported. Cookhouse and feedyard for the month are prorated against the respective amounts of labor performed by men and teams. Bridge material is distributed among the sections and sub-sections as reported and equipment used is noted in a column by itself.

The monthly reports thus obtained and segregated are entered in a ledger against the several sections and subsections of the district. At the end of the year the totals are brought down and the depreciation in the equipment, obtained by taking the difference in the estimated value of the equipment at the end of the year and the estimated value at the beginning of the year plus amount bought, is prorated against the several sections and sub-sections in proportion to the cost of labor done.

This gives at the end of the year a thorough report on the cost of maintenance and construction and, in addition to being valuable data, it has been the means of saving this county much, both in the accurate check given all claims and also in the purchase of materials and the systematic arrangement of the work in connection with the roads.

The several reports have the following column headings:

Supervisor's Monthly Report, Bridge Material—Date; From whom and what purchased, amount; Date; How accounted for, amount.

Tools and Machinery—Same as above. Cookhouse Supplies—Same as above. Feedyard Supplies—Same as above.

Supervisor's Labor Report, Individual—Name of employee, month and year, name of supervisor; Bridge or section; Nature of work; 1, 2, 3 (a column for each day); No. of hours; Rate; Amount. This is checked and signed by the county engineer, and the supervisor signs the statement: "I hereby certify on honor that the foregoing report is just, true and correct; that the person whose name appears thereon actually performed the labor as stated, on the dates shown, and that the amounts are actually true as stated."

POPULARIZING PURIFICATION PLANTS

How Grand Rapids Dispels Popular Prejudice Against Use of Chemicals in Water Purification Plant—Use of Models and Charts.

By CHESTER W. SHAFER.

The problem of educating the public to the concrete values of filtered water and thereby dispelling the prejudice that is common in most cities against a municipal filtration plant has been the object of study by L. D. Cutcheon, the manager of the million-dollar water plant at Grand Rapids, Mich. In the course of his study he has evolved a plan which, by explaining lucidly all the details of the plant operation that, unexplained, would have a tendency to induce suspicion and prejudice, has created in the minds of the public a realization of the injustice and falsity of adverse prejudice. Since the installation of the plant several years ago the "kicks" and complaints reaching the offices of the Board of Works have diminished from a substantial daily number to an average of one a month, and the general cry or protest

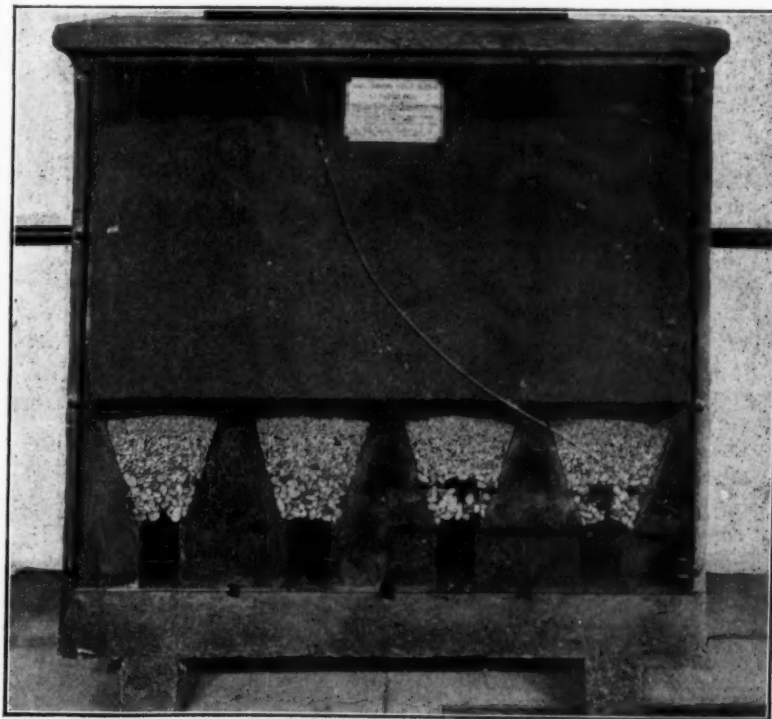


FIG. 2. MODEL OF A SECTION OF FILTER.

against "chemically treated" water that was rampant at the outset has completely disappeared.

The first step of Mr. Sperry's plan was to inaugurate an "Open Door" policy at the filtration plant. He made it known through newspaper advertising that each and every citizen of Grand Rapids was welcome to visit the plant at any time and that every effort would be made to explain the "inside" workings satisfactorily. He then instructed every man connected with the industry in the art of explanation, particularly his assistants. In order to facilitate this work of explanation and to make it possible for the ordinary visitor to get a quick and clear conception, he prepared a series of charts, diagrams and models of the filter arrangements, which were set up in the main halls and chambers of the plant. Each one visualized important processes and results of the plant workings.

When a visitor appeared he was immediately given a short talk on the fundamental theories of the plant and was given a general idea of the action of the lime and alum used and in what respects the water of the river (the source of supply) differs from the water that leaves the plant for the city. He is then taken to a chart (Fig. 1)

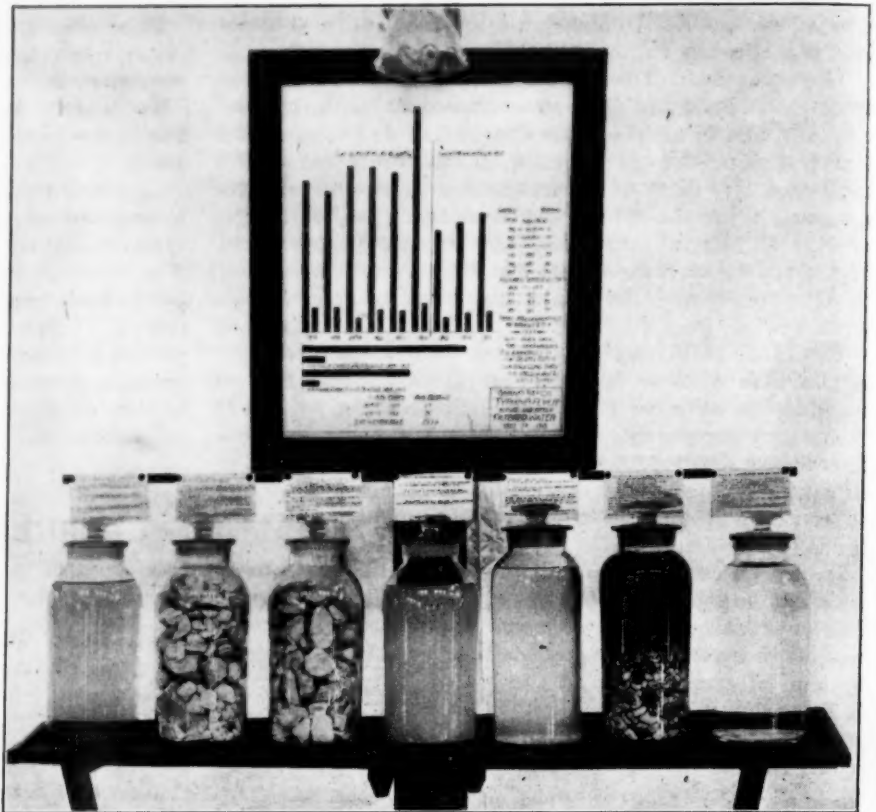


FIG. 3. DIAGRAM OF TYPHOID CASES AND DEATHS BEFORE AND AFTER FILTRATION. ALSO SAMPLES OF WATER BEFORE, DURING AND AFTER TREATMENT, AND OF LIME, ALUM AND FILTERING MATERIAL USED.

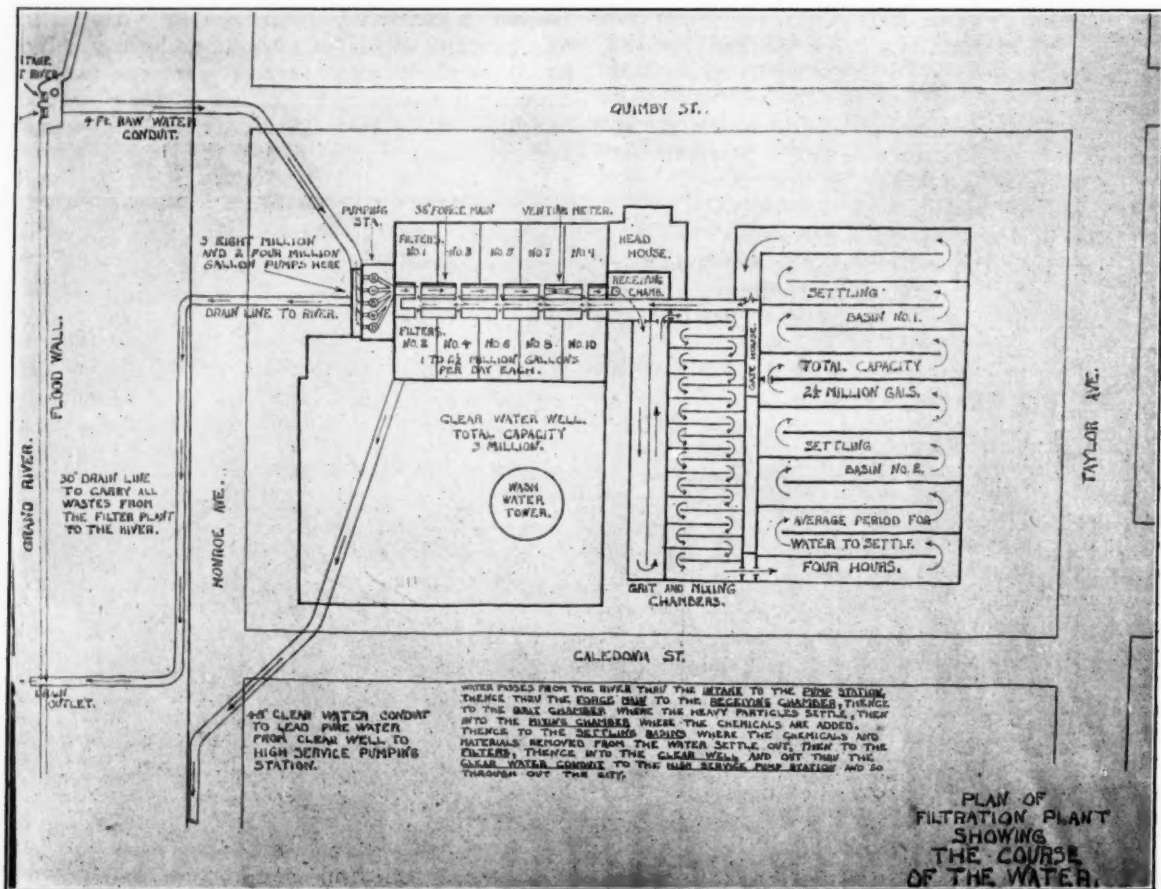


FIG. 1. PLAN OF PLANT, FOR THE INFORMATION OF VISITORS.

which shows the exact progress of the water, with all attendant influences, from the time it is pumped from the river until it is forced into the mains. Then the visitor is given an explanation of the workings of the filters, which explanation is enhanced by an accurate model (Fig. 2) of a filter, specially built by Mr. Sperry. He is then taken through the plant and is shown how the mixing tanks and settling basins operate.

With these facts definitely in mind the visitor is then carried through a series of charts and models. The first (Fig. 3) is a series of seven bottles, each with a descriptive card attached, showing the river water as it is pumped to the plant most of the year; the alum and lime used; the river water after it is treated with lime; the water at the end of the settling basins where it is ready for the filters; the sand and gravel used, and the water from the clear well. Above these bottles is a chart showing the number of cases and deaths from typhoid fever for a period of six years before the introduction of filtered water, compared with the cases and deaths resulting to date after the introduction. By means of these the visitor is given an excellent idea of the fundamental relation that alum and lime and sand had to the producing of a clean, soft, pure water. He is also given an insight into the results upon which are based the first and most important reasons for the operation of the plant.

The visitor is then shown the blueprints and the bulletin board, on which the daily and monthly operating details of the plant are recorded. Although these figures are not understandable to the average visitor, they clearly understand that the "Open Door" policy is being pursued, and this publicity is consequently very valuable.

The next exhibit is a chart which shows the action of the lime and answers specifically the puzzle: "How can lime remove lime?" It shows the cycle of change made by the lime and traces the stone from the quarry through the kilns to the lime-water tanks at the plant. It also shows the attack on the limestone of the river bed by the carbonic acid of the air and the rendering of hardness. The action at the plant is shown and all relations explained.

The next exhibit is a chart dealing with the well water situation. Here a drawing is displayed showing how pollution travels from the privy to the well. Another blueprint shows the bacterial history of the plant by days for each month, and on a table beneath are tubes and plates which show the types of tests applied to well water on surveys made in the various wards of the city. It is here that any tests on water brought in by visitors are made.

In completing the tour of the plant the visitor is shown the Venturi meter and the clear well. The meter is shown to be necessary for determining the volume of water being treated at all times, so that the proper amounts of lime and alum may be added. A vertical pipe connected with the clear well enables the visitor to look to the bottom of this, illuminated by an incandescent lamp, and satisfy himself of the clearness of the filtered water.

These charts and exhibits are simple and easily ex-

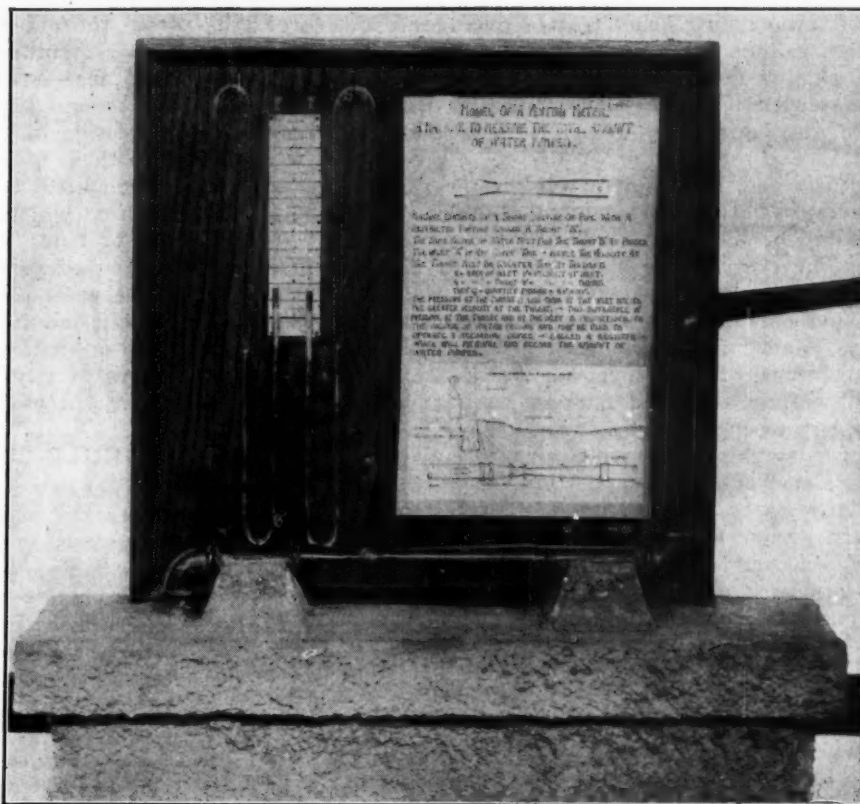


FIG. 4. WORKING MODEL OF VENTURI METER AND INDICATOR.

plained and it requires little time to pilot a visitor through the plant and give him an idea of the how and the why of the treatment, and to convince him that nothing is being held back or secreted—that everything in the plant is open and above board. This fact alone inspires confidence, and once this confidence is secured, the attitude toward the plant is favorable.

COST OF OPERATING FITCHBURG SEWAGE DISPOSAL PLANT

The sewage disposal plant of Fitchburg, Mass., which was described in *Municipal Journal* for September 17th, 1914, was first put in operation in October, 1914, but all parts of the plant were not in full working condition until June, 1915.

The works have, therefore, been in complete operation for about eighteen months and are said to be treating sewage in a manner which is satisfactory in every respect. The sewage flows through Imhoff tanks, remaining in these for from three to eight hours, depending on the volume of flow and number of tanks in use. The effluent from these passes into the dosing tank, which discharges it onto trickling filters at intervals of about twenty-one minutes, each dose or discharge of the tank being about 50,000 gallons. The effluent from these trickling filters flows into secondary tanks providing a retention period of about one hour, from which the final effluent flows to the river. The sludge from the final or secondary tanks is pumped back to the Imhoff tanks. The sludge from the Imhoff tanks is pumped to drying beds, on which the water content is reduced from 90 per cent to an amount which permits the sludge to be shoveled up from the beds. Thus far the sludge has been used as top soil on the gravel slopes at the works, and to fertilize around the shrubs and vines.

Although the Imhoff tanks could probably care for a flow of seven million gallons a day with ease, and the trickling filters for about five million gallons, the amount

of sewage now being treated averages about three million gallons. The number of men employed daily is six, including the chemist in charge; but other laborers are employed for a few days at a time whenever the work requires additional help. It is estimated by David A. Hartwell, chief engineer of the sewer system, that the yearly cost for maintenance for the next five years will average between \$13,000 and \$14,000 a year, or about \$37 a day, or about \$12 a million gallons.

The cost of the plant was about \$321,000, including \$25,000 for the land. If we take 4 per cent interest and 6 per cent sinking fund on the cost of the plant, this gives an annual charge of about \$32,000 which, added to the maintenance cost, gives about \$45,000 a year, exclusive of certain overhead charges such as a portion of the salary of engineer and superintendent, which items, however, would be comparatively small. This gives an average cost of treatment per million gallons of a little over \$41. Based on capacity, the interest and sinking fund charge on the plant cost is about \$14.60 per million gallons, and if we assume the maintenance cost when the flow is double the present amount as being \$15,000 a year, the cost per million gallons for maintenance will then be about \$6.85; giving a total cost when the plant is working to full estimated capacity of \$21.45 per million gallons.

DATUM PLANES IN NEW YORK CITY.

The remarkable and, it is to be hoped, most unusual condition exists in New York City of the use by the various city departments of twelve different datum planes, the difference in elevation between the extremes of which amounts to 5.295 feet. The special Committee on Datum Planes of the Municipal Engineers of the City of New York have thoroughly investigated the matter; and while a determination of the facts is not equivalent to a remedy, it at least points out the necessity of one and gives the data on which such remedy can be based, which gives hope that it will be applied.

According to the figures presented by this committee, based upon careful comparison by means of precise levels between the bench marks of the different departments, the following conditions exist:

The Board of Estimate and Apportionment and the Board of Water Supply use the standard datum of the United States Coast and Geodetic Survey, which is mean sea level at Sandy Hook. The Dock Department datum is 2.103 feet below this, or mean low water at the Battery. The Croton datum is elevation—0.786; that of the Brooklyn Waterworks is 1.680; that of the Brooklyn Sewer Bureau is 1.678, and that of the Bridge Department is 1.677; the variation between these being due apparently to inaccuracy in establishing their respective bench marks. The datum of the Brooklyn Highway Bureau and the Topographical Bureau is 2.547. That of Bronx Borough is 2.608; Public Service Commission, 2.653; Queensboro and Long Island City, 2.725; Highway and Sewers Bureaus of Manhattan, and New York Central Railroad, 2.750; and finally the Richmond Borough datum is 3.192.

Richmond Borough is an island separated from the rest of the city and little confusion results from the fact that its datum is so much higher than many of the others. Brooklyn and Queensboro are separated from Manhattan by a wide body of water, but the datum planes for these contiguous sections vary from 2.547 to 2.721—about 2¼ inches—sufficient to make an awkward junction between either sewers or pavements which were laid according to these different standards. The Brooklyn Water Supply, Sewer, and Bridge Departments use practically the same datum plane, but one which differs

from the other Brooklyn departments by nearly a foot. In the Island of Manhattan we have differences totaling 4.853 feet—sufficient to make the comparison between the several structures impracticable without a previous correcting of the elevation of one department to agree with those of the other.

As stated, the condition is probably an unusual one, but that which brought it about can be found in a number of cities, especially the larger ones, this being the entire independence of departments having charge of the several classes of public works of the city. This is only one more illustration of the great desirability of a co-ordination and co-operation of all of the departments of city services, even if a combination of them under one head is not thought desirable.

DRILL-CUTTING ASPHALT PAVEMENTS.

In making patches or doing any other work which requires the removal of asphalt pavement, the ordinary practice is to cut the patch through to the concrete by means of chisels and heavy hammers, two or three men being employed to each chisel. A contractor in Salt Lake City who had a contract which required the removal of a strip of asphalt and concrete pavement along the tracks of the street railway, conceived the idea that the cost of labor and of time also could be reduced by using for this purpose hand air-hammer drills provided with chisels.

He accordingly purchased two Sullivan 40-pound hammer drills operated by a small steam-driven air compressor. The line to be cut was marked off and the cutting done with the hammer drill, using a channeling bit. When a sufficient distance had been channeled, a gadding bit was used and by this the surface material was removed down to the concrete. Following this, the gadding bit was again used for breaking up the concrete, this being done by holding the drill in a nearly vertical position and wedging off pieces of concrete. Blocks of concrete from four to eight inches square were broken off in this way. One man using this hand drill was able to take up asphalt and concrete base at an average rate of six lineal feet one foot wide in fifteen minutes. It was stated that had the contractor used three men double-jacking by the old method of hand work, they would have required forty minutes to remove a like amount.

The twenty-horsepower portable air compressor used for the work cost \$1,780. Two hammer drills cost \$170, and the hose, bits, etc., \$50 additional, or \$2,000 for the entire outfit. Assuming 6 per cent. interest and 15 per cent depreciation on this plant, gives \$420 per year; or if we assume one hundred and seventy-five days of actual work a year, gives \$2.40 a day for these charges. If to this be added \$3.50 per day for engineer, \$5.00 for two drill operators, \$0.50 for oil and waste and \$4.60 for twenty gallons of gasoline, we have a total cost per day of \$16. This outfit enabled two men to work with the air-hammer drills, performing about three hundred and eighty-four lineal feet of one-foot strip removed in a day, making the cost a little over four cents per square foot, or 37½ cents a square yard.

GOOD ROADS IN CALIFORNIA.

California in November carried by 542,239 to 137,107 a vote on a \$15,000,000 bond issue for more good roads. In 1910 the vote on the \$18,000,000 issue to inaugurate a state highway system carried 93,297 to 80,509; and 14 counties voted against it, while last year every county voted for it. This gives a good indication of the growth in popularity of good roads in that state, and still more, probably, of the confidence that the people have that the amount originally voted has been spent to good advantage by the state officials.

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DOSING WATER WITH CHEMICALS.

The use of coagulants in purifying water is objected to by many citizens who wish to have their water "pure" and not "dosed with chemicals," or otherwise changed into a manufactured soft drink. As an illustration of what they object to, St. Louis last year treated its water with 13,793 tons of lime, 4,509 tons of sulphate of iron, 1,413 tons of sulphate of alumina and 28 tons of chlorine; a total of nearly 20,000 tons of "chemicals." The popular objection to such treatment has, in several cases, interfered with the adoption of rapid filtration with its necessary accompaniment of coagulation.

Most of this objection centers about the two words "pure" and "chemical." The purest water to be found outside a laboratory contains mineral matter in solution, and if it did not, the taste would be so flat that most would refuse to drink it. Probably any citizen would be satisfied that water direct from a deep well is pure according to his standard of purity. An analysis of well water, taken at random from a report on the waters of Illinois, gives the water from a well two hundred and seventeen feet deep as containing potassium nitrate, potassium chloride, sodium chloride, magnesium chloride, magnesium sulphate, magnesium carbonate, calcium carbonate, iron carbonate, alumina and silica. Certainly any chemist that proposed dosing a public water supply with a mixture like that would be driven out of town, and yet each gallon of this "pure" water contained 50 per cent more by weight of these minerals than was the total weight of chemicals added per gallon to the St. Louis supply in treating it.

If we consider the Mississippi river water at St. Louis, we find dissolved in this the same minerals as in the well water referred to, but in greater quantities. The amount of chemicals applied in the filtration plant totalled only about half of the total amounts contained originally in the

water, and the effect of these was such that the water, as it left the plant, contained only three-fourths as much dissolved minerals as the "pure" well water above referred to.

It is important to note, also, that, although lime was added to the water, it was all precipitated and retained in the plant and also removed half of the lime originally contained in the river water. Of the sulphate of alumina and sulphate of iron added, only 0.6 of one per cent was to be found in the effluent; and if a customer should drink ten glasses of the filtered water a day, he would have to keep this up for one hundred and eighteen years to obtain one ounce of these chemicals. On the other hand, the addition of this minute amount of chemicals resulted in removing from the water two hundred and fifty times as much of the minerals already dissolved in the river water. So much for the "dosing" and spoiling the "purity" of the water.

As to the word "chemicals": These consisted, as they do in practically all purification plants, of lime, which is already contained to a greater or less extent in most spring and well waters; iron, which is also found in most ground waters; and sulphate of alumina, the popular name of which is alum. While to a chemist effecting chemical combinations, these matters are chemicals, when called by their popular names it is seen that they are substances familiar to the ordinary citizen and not thought of by him as being chemicals. If, instead of being informed that chemicals were added to the water, he were told that the materials and amounts contributed to the water which he drinks in one day would be equivalent to that obtained by placing in said water the smallest visible particle of limestone and of alum and stirring the water for a minute or two with an iron spoon, it would seem probable that his horror of the use of the "chemicals" would be dispelled. The additional information, proved by figures, that half of the cities of the country of any size are now filtering their water supplies should complete his conversion.

In this, as in so many other departments, most opposition is due to ignorance, and an educated public is not hostile to real benefits and improvements. The results obtained at Grand Rapids by the methods described in this issue serve as an illustration of this.

TESTING SEWER PIPE.

It is not often that the desirability of testing sewer pipe is brought home so forcibly as was the case in Boulder, as described in this issue; but this extreme case at least serves to illustrate what may happen (and perhaps does happen more often than is known) when the sufficient strength of a pipe is taken on faith. It has now become common practice to test cement used (a cement manufacturer informs us that he believes that at least three-fourths of the cities in the United States test cement now), and also cast iron pipe, steel plates for standpipes and other materials and manufactured articles. There would therefore seem to be no good reason why sewer pipe also should not be tested.

Two outfits for testing pipe are described in this issue. One is extremely simple; but even the more elaborate one is by no means expensive, costing only as much as a few feet of the large sewer pipe tested by it. No exact standard tests for sewer pipe have yet been generally agreed upon, except those adopted by the American Society of Municipal Improvements, to which some take exception. But the tests for strength only described this week are simple and would prevent such a collapse of sewer as was described.

THE FIRST ANNUAL REPORT.

The first report for the year 1916 reached this office on January 5, being that of the city engineer of Richmond, Ind. In the fifteen tables presented, Mr. Charles shows in detail the work performed for the \$102,785 spent. He also gives the unit costs, and calls attention to the fact that "the costs are shown in accordance with the Standard Units of the American Society of Municipal Improvements, whereby comparison can be made with like costs in other cities."

We hope that many more reports for 1916 will be found to have used these units; and that all city engineers who have not yet adopted the units will do so for all work of 1917. Both for his use of these units and for his promptness in giving to the city officials and the citizens an accounting of his year's work, we wish to commend Mr. Charles for this report.

GARBAGE DISPOSAL IN LOS ANGELES.

In Municipal Journal for June 10, 1915, was published a description of the garbage disposal plant in Los Angeles, and an account of its operation. A few weeks ago an official of that city gave before the League of California Municipalities up-to-date information concerning the operation of the plant. He stated that, during the operation since March, 1915, the plant had proved quite satisfactory as to results, and, so far as he knew, had never proved offensive to those living near by. When the plant began operations about 25 tons of garbage per day was delivered to it and this increased gradually until January 1, 1916, at which time the plant was taking all the garbage produced in the city, which averaged about 153 tons per day during the year just past. In addition to this it is estimated that about 12,000 tons of non-combustible rubbish was collected. The weight of the garbage is given as about 1,200 pounds per cubic yard and that of the rubbish as about 229 pounds per cubic yard. This is equivalent to 209 pounds of garbage and 406 pounds of rubbish per capita per year. Refuse and garbage are collected from 48,720 different places, of which 512 places are served seven times a week, 11,058 places three times a week, and 37,150 places twice a week.

Collection is performed by the city, sixty steel canvas-covered wagons being used, each holding about four cubic yards and drawn by two mules. At the plant the refuse is taken into the green garbage building and then, after being picked over, and the paper and other material which could be used in producing steam having been sorted out, is taken by belt to the reducer building. It is estimated that from the garbage is obtained 310 pounds of tankage and 62 pounds of grease, and that the former is worth \$2.17 a ton and the latter \$3.41.

Relative to the amount of water which the city is required by its contract with the company to deliver to the plant (as stated in our description previously referred to), Mr. Knowlton stated that the garbage plant is the largest consumer of water in the city. For the year ending June 30, 1916, the average amount of water required by the plant was 1,500 cubic feet per ton of garbage. At the usual city rate of seven cents per 100 cubic feet, this gives a cost of \$1.05 per ton of garbage for water. The company pays the city \$0.51 a ton for all garbage delivered at the plant, but this cost of water would apparently make the disposal actually cost the city \$0.54 a ton. It has recently been proposed that the city furnish the company 1,200 cubic feet of water per ton of garbage free of charge, the company to pay for all water used in excess of this.

Describing further the refuse collection in the city, the speaker stated that, for the westerly sections, two motor trucks have been placed in operation during the past year,

each of which makes two trips a day, the cost averaging \$2.75 per ton. Each of the trucks has a driver and two collectors. Trucks are used because the distance from the farthest point of collection in these sections to the plant is about eight miles.

In the business district the collection is made at night at a cost of about \$1.15 per ton. In the residential section, the work is done during the day, two collections a week costing about \$2.39 per ton. Averaging the entire city, the cost during the past fiscal year has been about \$1.97 per ton. These costs include overhead charges, interest and depreciation.

The non-combustible material collected by the city is deposited in five different places by seven motor trucks, each with a capacity of about ten cubic yards. During the past year these have collected 48,000 cubic yards at an average cost of \$0.94 per cubic yard. The cost of operating the trucks has been about \$9.00 per day.

SET BACK LINES

Set-Back Lines Recommended by Committee of Board of Estimate and Apportionment—Advantages to Property Owners and to City.

The adoption of the elastic street idea, explained and advocated by Municipal Journal in several articles during 1916 ("Practical Street Construction"), is now being considered for New York City. The secretary of the Committee on City Plan of the Board of Estimate and Apportionment, Robert H. Whitten, has suggested the adoption of the idea for streets in sections of the city as yet wholly undeveloped or devoted to suburban residences. In recommending the securing of elasticity by adoption of "set-back" lines, Mr. Whitten says: "The set-back line secures on certain streets a uniform set-back of buildings from the street line; that is, the owner is compelled to leave a yard or court across the front of his lot. He may use this yard for any private purpose, but may not build upon it. The advantages of the set-back line are:

"(1) *Health, Comfort and Amenity.* In a private residence section a uniform set-back from the street line increases the attractiveness of the section and adds to the health and comfort of the inhabitants. It improves light and air conditions; makes possible the front lawn with trees and shade; removes the dwelling further from the noise, fumes and dust of the street. Where residences are uniformly set back from the street without the establishment of a legally binding set-back line, each owner is at the mercy of his neighbors. A voluntary set-back of this kind is often worse than no set-back at all. A single owner by disregarding the set-back line may ruin the entire block.

"(2) *Economy of Initial Development.* Purely local residence streets having a set-back line can be permitted a narrower width than could otherwise be allowed. This reduces development expenses, not only in its economy of land, but more markedly in the decreased outlay for paving. With a 10-foot set-back a standard 60-foot street might be reduced to 40 feet. This might be adequate for streets under 800 feet in length if developed with single family houses. If later the single family houses were replaced by three or four-story apartments, the street could easily be widened to 60 feet to meet the increased traffic requirements incident to the more intensive housing.

"(3) *Economy of Ultimate Development.* The existence of the set-back line will permit the economical widening of traffic arteries whenever traffic needs require. It introduces a measure of adaptation and elasticity in street design that is of immense importance in view of the

almost prohibitive expense of widening a street once laid out and improved.

"The fixing of the set-back line now is the only practical method by which the widening of many traffic arteries can be secured in the future when greater width will assuredly be required. These arteries are now residence streets and the houses have been set back in order to provide lawn and shade and to remove them from the dust, fumes and noise of the street. They cannot be widened at present, as the cutting off of the front lawns would in large measure destroy the value of the dwellings. When, however, traffic has so increased that the street must be widened, it is more than likely that the street will be no longer desirable for private residence purposes and the private dwellings will be replaced either by apartments or by business buildings.

"A street once established is one of the most permanent and unchangeable features of the city structure. Buildings have come and gone, but the street lines of Lower Manhattan have retained most of their original idiosyncracies. This too in spite of the fact that the burden imposed differs greatly in character and magnitude from any that could have been contemplated at the time these streets were opened. This points to the desirability of introducing adaptability and elasticity in street design. The set-back line is a means of securing such adaptability and elasticity in a considerable measure. When we consider the practical impossibility of materially changing a street system once established and improved with expensive buildings, and when we consider, too, how imperfectly we can foresee the demands that will be made upon the street system even fifty years hence, the importance of making the greatest possible use of the set-back line as the most effective means of securing adaptability to increasing or changing street requirements, is apparent.

"In suburban sections a private dwelling built on the street line, with no lawn or trees in front, is scarcely marketable. In the best apartment sections, however, street after street of high apartment houses are erected right on the street line and without a bit of vegetation between the buildings. It may be that such dwellings will in the future be considered as undesirable and out of date as the old time dwellings that opened right upon the street pavement. If so, the present economy of space between buildings and the exclusion of grass, shrubs and trees will prove most unfortunate. It does not seem reasonable that the more intensive development required by increasing population should necessitate a sacrifice of all of the amenities created by trees, grass and a small open space between the dwelling and the paved street.

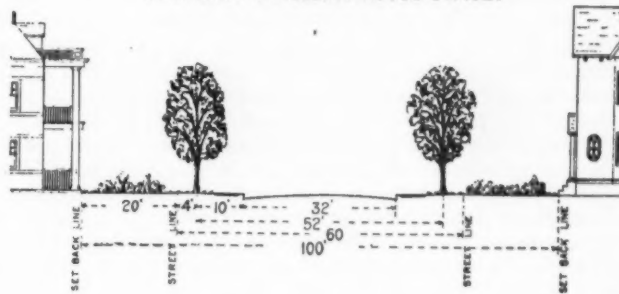
"In Washington, D. C., and in a number of the cities and towns of Connecticut and Massachusetts, set-back lines are established under procedure similar to that used in the laying out, opening and acceptance of streets. In Massachusetts, Boston has made considerable use of the set-back line, but the greatest progress has probably been made by the town of Brookline. As to new streets, that town has adopted the policy of making the establishment of a set-back line a condition precedent to the acceptance of the street by the town. The set-back lines established vary from five to twenty feet, the average being about ten feet. The town has also established set-back lines on a considerable number of streets already opened and improved.

"The set-back line procedure should follow in a general way the present methods as to the laying out, opening and acceptance of streets. Set-back lines should be laid down, where appropriate, as a part of the tentative and final maps submitted by the borough authorities and approved by the Board of Estimate and Appor-

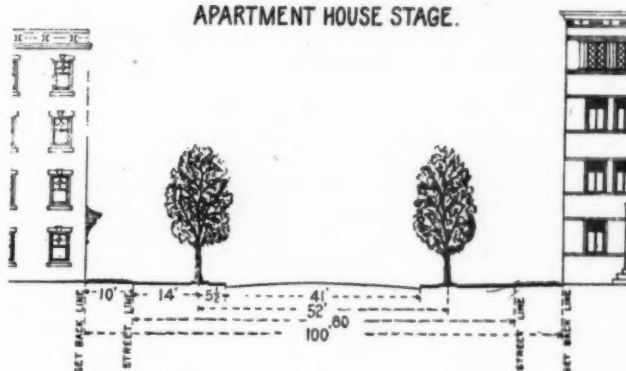
tionment. When the street is opened, the opening proceeding should include the establishment of the set-back line. The establishment of the set-back line as laid out on the city map should be a condition precedent to the acceptance of the street by the city; or to the approval of the map of a land subdivision for record. In parts of the city where no map has been approved, the acceptance of streets and the approval of land subdivisions should be subject to the establishment of set-back lines wherever reasonable and appropriate.

"Procedure should also be provided whereby, in the case of streets already opened, set-back lines may be established if needed and if their establishment is still

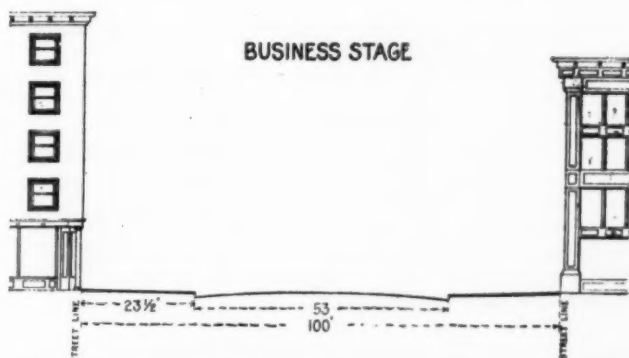
DETACHED DWELLING HOUSE STAGE.



APARTMENT HOUSE STAGE.



BUSINESS STAGE



STAGES IN THE DEVELOPMENT OF A 100-FOOT STREET AS INFLUENCED BY SET-BACK LINES.

practicable. The procedure should make it possible in special cases to permit any existing buildings projecting beyond the set-back lines to remain for a fixed period or until substantially altered, removed or destroyed. This is a very important power in securing an economical application of the set-back principle. It has proved a useful feature of the English and the Massachusetts statutes. It was also incorporated in the special act of 1899 establishing a set-back line on Clinton avenue, Brooklyn."

The committee has referred Mr. Whitten's report to the chief engineer of the Board of Estimate and Apportionment, Nelson P. Lewis, for a more detailed statement of the economy both to owners and to the city that it is expected will result from the set-back plan.

The WEEK'S NEWS

Road Research in Washington—California State Highway Work—Report on Minneapolis Health Department—New Sewage Disposal Plant for Dallas—Water Supply of Providence—Firemen Killed on Duty in Union Hill, N. J., Lewiston, Pa., and Flint, Mich.—San Francisco's Detectives—Portland, Ore., Under Commission and Council Administrations—Council Against Mayor in Newark, N. J.—Ohio Cities' Finances—Atlanta's Garbage Plant—Milwaukee's Street Cleaning Costs—New York Mayors Discuss High Cost of Living—Omaha's City Plan Commission.

ROADS AND PAVEMENTS

To Record Road Histories.

Tacoma, Wash.—The continuous history of every piece of road in Washington will soon be made part of the records of the county engineers of the state. This tabulation, it is claimed, will help to properly control highway construction. A systematic record of the construction, the wearing qualities, the upkeep and the length of life of roadways in the state was recently decided advisable by the joint meeting of the State Association of County Engineers and the State Association of County Commissioners at Tacoma. Each of these groups appointed a committee to co-operate with the state highway engineer's office and a committee chosen from the university faculty by President Henry Suzzallo of the state university. The general committee will develop a system of records designed to give in detail all the facts of construction and maintenance of every road in the state. This tabulation is to be kept in the office of the county engineer who supervised the building of the highway. Any road or piece of road which wears out too fast or is found unsatisfactory in any way will be investigated. A good road, one which shows tough wearing qualities or is particularly adapted to a certain kind of traffic, may be duplicated in other parts of the state. The committee appointed by President Suzzallo from the university faculty is composed of Dr. Henry K. Benson, professor of industrial chemistry and member of the Federal Industrial Research board; William F. Allison, professor of highway and municipal engineering, and Dean Almon H. Fuller, professor of civil engineering and dean of the college of engineering. Dr. Benson is chairman of this division of the general committee. The committee, after it has established a workable system of records, will turn its attention to research. It will investigate and try out new materials and processes for road building.

New Bridge Completed.

Kearney, Neb.—The new bridge across the Platte River south of this city, has been opened to travel. The bridge is 1,000 feet long and 20 feet wide, built entirely of concrete. Fifteen hundred feet fills to both the south and north end complete the river crossing. The bridge was built by the Omaha Structural Steel Company at a cost of \$60,000, of which the state paid one-half.

To Investigate Bridge Defects.

Wilkes-Barre, Pa.—Investigation of the East End bridge is to start at once. City Engineer Bert Finch has been instructed by council to start an inspection to determine the cause of the crumbling of the concrete and to ascertain just what defects there are in the structure that was built only two years ago at a cost of \$118,000. The city engineer has also been instructed to estimate the cost of the repairs and the city solicitor will be directed to proceed at once to hold the contractors to account. Defects in the bridge were discovered soon after it was built, Solicitor McHugh declares. Over one year ago the crumbling of the concrete was noticed. The matter was taken up with Neeld & Company, the contractors, so it is alleged, and their engineers came on here to investigate. As the company is bonded, it is responsible for the repairs, so it is pointed out, but there is no real explanation of the delay in the repair work for a year. Building Inspector Jacob Held said: "The East End bridge is one of the worst concrete jobs that I have

ever seen. The structure is crumbling. Possibly the steel reinforcements are not heavy enough, and produce the vibration that causes the crumbling. Irrespective of the cause, the fact is that the bridge is crumbling and that large chunks of concrete are falling, making it necessary to prop it up." City Engineer Finch admitted that the failure to place connecting rods along the elliptics was responsible for the crumbling of the concrete in parts, but he claimed that this was a slight oversight that could be easily remedied. The bridge was built by the city and the railroad companies jointly.

State Highway Work in California.

Sacramento, Cal.—The state highway commission in a report filed with Governor Hiram W. Johnson states that with the completion of contracts for 153 miles of road recently let under the \$18,000,000 bond issue, 1,562 miles of state highway would be completed. The complete state system, under the original plan, would consist of 3,300 miles, exclusive of two or three laterals authorized at a cost not to exceed \$3,000,000 under the \$15,000,000 bond issue. The report states the remainder of the proposed state highway can be completed under the \$12,000,000 available. A recapitulation of what the state has received for the \$18,000,000 outlay shows the following mileage constructed by the commission: Concrete base, thin bituminous covering, 941.88 miles; concrete base, Topeka surfacing, 18.08; concrete base, asphalt surfacing, 5.41; macadam, Topeka surfacing, 16.54; macadam, oiled 158.46; asphaltic concrete, 1,037; bridges, 84; graded only, 410.65; making a total of 1,562.23 miles of state highway.

SEWERAGE AND SANITATION

Health Department Criticised.

Minneapolis, Minn.—That Minneapolis has a health department which is "obsolete and wholly inadequate for the city's needs" is the sweeping criticism passed by Dr. G. B. Young, of the U. S. Public Health Service. His conclusions, embodied in a report submitted to the state board of health and to Mayor Wallace G. Nye, were reached after three months' study of the local department. The criticisms, he explains in the course of his report, are not directed against individuals, but against general methods. "Most of the defects," he pointed out, "are inherent in American municipal government. The fundamental defect of the Minneapolis health department is that it does not enforce the laws, never has enforced the laws, and never will enforce the laws." The survey of the local department was made at the invitation of the city council. Among the points scored by Dr. Young are these: Minneapolis has made very inadequate provision for the protection of the public health and as a result is not securing the full benefits of the exceptionally favorable local conditions. The laws under which the health department is organized are obsolete. The equipment and plant provided are inadequate. The administrative methods are, for the most part, out of date. They give the commissioner no effective means of controlling his subordinates or of utilizing the results of their activities as the foundation for further work. It will be very difficult to remedy existing conditions until the civil service law is so amended as to make the selection, assignment, promotion or retention of department employees entirely dependent upon merit. A probationary period of six months should also be provided, during which the commissioner should

have authority to discontinue the services of any employee found unqualified or unadapted for his duties. The total exclusion of the health department from any voice in the control or conduct of the hospitals for contagious diseases is criticised as being illogical. The prevention of the spread of communicable diseases as now understood rests upon two principles—their prompt discovery and their intelligent supervision. At present the health department is largely denied any control of the agencies for obtaining either result. It would be a serious mistake to make a very large increase in the present appropriation until the necessary administrative organization has been established.

Dr. Young also embodied in his report a number of important recommendations for the immediate and ultimate improvement of the department. Among these is the passage of a law creating a health department entirely independent of political control, presided over by a commissioner appointed by the mayor for a term of at least three years, the appointee to be removable only for cause and to have ex-officio membership on the board of charities and correction and the board of education. For the present, any additional funds provided, says Dr. Young, should be spent upon improving the plant and administrative organization; upon developing the use of nurses in the work of the medical division, and upon the educational work necessary to develop a public opinion authoritatively informed upon sanitary needs and methods. Standards of work and of efficiency markings should be made the sole grounds for promotion. Steps should be taken at once for the effective utilization of the present provision of the law in regard to co-operation by the police in reporting of violations of sanitary ordinances. A housing law should be secured, urges Dr. Young, giving the health department the duty of passing upon all plans for new structures or the alterations of existing ones as far as concerns air space, ventilation, sanitary conditions and plumbing.

City Will Supply Pneumonia Serum.

New York, N. Y.—Health Commissioner Haven Emerson has announced that the department would supply for the treatment of lobar pneumonia the serum treatment which has been perfected by the Rockefeller Institute of Medical Research. This step, he said, might prove to be the means of lessening materially the death rate from pneumonia in New York City, which amounts to about 10,000 a year. The health department now distributes antitoxin for the treatment of tetanus, diphtheria, and meningitis. The pneumonia serum will be made at the health department's farm at Otisville, N. Y., where the other serums distributed in New York City by the department are made, as well as tetanus serum for the use of the army hospitals of Europe. The serum the health department will make and distribute is for the treatment of lobar pneumonia, which constitutes about 60 per cent of all cases. "The department," Dr. Emerson explains, "wishes to make it very clear that it is not going into the business of treating pneumonia. It is not going to be a wholesale physician. What we will do is to diagnose any pneumonia case upon submission, and when it is found to be of a certain type we will supply the serum for the treatment, and assist, if need be, in its administration. It must be borne in mind that the serum is for the treatment of one specific kind of pneumonia and is worse than wasted in other kinds. Furthermore, it must be used early in the case to produce results, preferably within six hours." The serum has been perfected under the direction of Dr. Rufus Cole of the Rockefeller Institute, where experiments in treating pneumonia have been going on for six years. For two years the institute has been treating cases with its serum, and the health department has been watching the results closely. The plan does not mean a new function of the department, but an extension of a well-established one.

Dallas Sewage Disposal Plant in Operation.

Dallas, Tex.—Mayor Henry D. Lindsley, Water Commissioner A. C. Cason and City Engineer Hal Moseley have formally inspected and opened the new sewage disposal plant. The new system (the building is shown in the illustration) cost \$500,000 and was under construction for nearly two years. The new system includes trunk sewers, interceptors, a pumping station and the disposal plant. There are seven outlets into the river. The Imhoff system is used. James H. Fuertes, consulting engineer, of New York, designed the system.

WATER SUPPLY

Providence Water Supply Development.

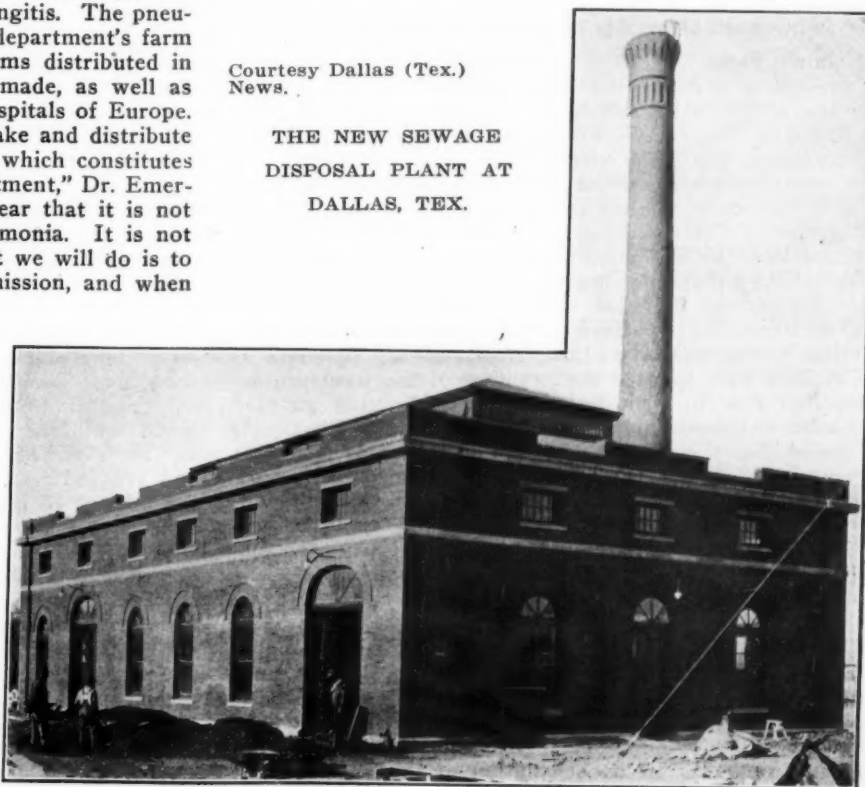
Providence, R. I.—A total of \$906,481.30 was spent by the water supply board in connection with the development of the new Scituate reservoir, in 1916, according to the second annual report of the board, presented to the city council. Of this amount, \$751,359.81 was expended in the purchase of real estate, on the site of the reservoir. The board states that it has on hand sufficient funds to carry on its work for the first three months of 1917, but that an additional \$1,000,000 bond issue will doubtless be asked before the end of the year. Engagement of Prof. Charles W. Brown of Brown University and Prof. W. O. Crosby of the Massachusetts Institute of Technology as geologists to investigate the earth formation on the site of the tunnel portion of the proposed aqueduct is announced in the report. Definite decision has been reached that the water from the new reservoir shall be filtered before being turned into the city mains, and that the bed of the reservoir shall not be stripped.

Commission Orders Lower Rates.

Charleston, W. Va.—Charleston consumers of water furnished by the West Virginia Water & Electric Co. will enjoy an appreciable reduction from the present water rate, the schedule prepared by the city council having received the approval of the public service commission. City Solicitor George W. McClintic presented the resolution, which embodies what is termed a compromise with the water furnishing company. Meter rates are now reduced by 25 per cent to those who use from 1,000 to 50,000 gallons of water monthly—from 32 to 24 cents. The new meter rates are: From 1,000 to 50,000 gallons, 24 cents per thousand

Courtesy Dallas (Tex.) News.

THE NEW SEWAGE
DISPOSAL PLANT AT
DALLAS, TEX.



gallons; from 50,000 to 80,000 gallons, 20 cents per 1,000 gallons; from 80,000 to 110,000 gallons, 15 cents per 1,000 gallons; from 110,000 to 150,000 gallons, 12½ cents per 1,000 gallons; from 150,000 to 300,000 gallons, 10 cents per 1,000 gallons; from 700,000 to 1,000,000 gallons, 7½ cents per 1,000 gallons; over 1,000,000 gallons, 5 cents per 1,000 gallons. It is also provided that where the annual flat rate is less than ten dollars no meter shall be installed and that where the meter rate is less than ten dollars per annum the meter shall be removed. The company is not required to install more than 800 meters a year.

State Engineer to Investigate Water Taste.

Sandusky, O.—The city has made formal request of the state board of health that an engineer be sent here to investigate the sources of city water pollution. This action was taken after hundreds of complaints had been filed because of the bad taste and odor that made the water objectionable for a few weeks. Health Director H. C. Schoepfle investigated the situation and then City Manager Ward and the health department officials decided to ask the state board of health, which has greater powers. "No sickness has been traced to the water supply," said the health director. "I believe that the water is just as pure now as formerly, but the taste and odor organisms have entered into the water and cannot be removed by filtration."

STREET LIGHTING AND POWER

Progress in the Study of Electrolysis.

Washington, D. C.—The electrolysis survey of the city of Omaha, Neb., by the United States Bureau of Standards was completed a few weeks ago and a report is being prepared to show the measures that must be taken to remove the difficulty. The bureau acknowledges valuable co-operation on the part of the various utilities involved in this work, which promises to have especially important results. The engineers of the Bureau of Standards are also examining the installation at Springfield, Mass., to see how nearly the results agree with predictions made from the design of the system. If everything is satisfactory, the same system will be installed throughout a large part of the city of Springfield. The experimental station is in West Springfield, and the work is attracting considerable attention from electrical engineers in other cities.

Council Overrides Franchise Election Result.

Klamath Falls, Ore.—The city council has refused to pass an ordinance, granting the Keno Power Company, a local concern, a fifty-year franchise to distribute electrical energy in Klamath Falls. The ordinance had been passed to a third reading and a city election had been held to indicate how the people wished the council to act. The election held in December resulted in 566 votes for the franchise to 122 against. The franchise was a so-called "model ordinance" drafted by the State Public Service Commission of Oregon. At a mass meeting local citizens adopted a resolution demanding that the three councilmen who voted against the ordinance reconsider and pass the franchise, according to the will of the people, or resign. Members of the council who opposed the granting of the franchise declare that the city's interests are not sufficiently guarded and asked that certain amendments be inserted. They were informed that this would require a new ordinance by the city attorney. The Keno Company is opposing delay for fear that the next Oregon Legislature may change the public utility laws to such an extent that they would be prohibited from operating here in competition with the Oregon-California Power Company, already established.

Company Fights Commission's Order.

Cleveland, O.—The right of the state utilities commission at Columbus to order gas companies to shut off their supply to plants and individuals using more than 100,000 cubic feet a month is challenged by the East Ohio Gas Company. The commission promptly turned down the company's request for a cancellation of the recent order.

The company then asked for a rehearing. This request also was promptly denied. It is expected the company will appeal to the supreme court. According to the gas company, the commission's action constitutes a violation of the state constitution in that it is an illegal exercise of legislative power. It is also claimed the order violates the federal constitution which decrees that no state shall pass any law impairing the obligation of contracts nor deprive any person of property without due process of law. The company claims its Cleveland franchise rights are endangered by this order. It furnishes a very large number of domestic consumers more than 100,000 cubic feet per month, it claims, in accordance with franchise stipulations. Enforcement of this order would involve the company in much litigation. The commission had ordered gas to large users to be cut off in order that home owners shall be first served, where there is a shortage. The company attacked the constitutionality of the state law which gives commissioners authority to take "arbitrary action" when a gas shortage results in an emergency.

Canadian Cities Vote on Hydroelectric Projects.

Niagara Falls, Ont.—Ontario municipalities were very vigorous in their support of Sir Adam Beck and the Hydroelectric Commission and the commission's proposal received big majorities in the recent election. The municipalities favored direct control of the prospective waterpower development at Chippewa by the Hydroelectric commission rather than by the provincial government and its politics. This city gave a majority of 824.

FIRE AND POLICE

Two Firemen Killed in Auto Crash.

Union Hill, N. J.—Two firemen were killed and six injured when an auto fire engine, in answering an alarm, swerved into a lot. Christopher Franz, the driver, attempted to turn out of the path of an approaching automobile. He pulled the wheel too far and the heavy machine ran into a lot and grazed a tree. The engine was wrecked. The automobile cost \$8,000 and had been bought for the department about three weeks ago. Those killed were William Ross, who was pinned between a tree and the car, and Frank Schaeffer. Ross, whose back was broken and who died a few minutes after his arrival at the hospital, was hurrying home to be present at the expected birth of a child, but stopped to respond to the fire alarm. A son was born to Mrs. Ross almost the instant he died. Schaeffer, whose skull was fractured and arm broken, lived about an hour.

San Francisco's Detective Bureau.

San Francisco, Cal.—In the report of the recent municipal survey, the detective bureau was found to be particularly inefficient. Lack of supervision, energy and training were found to be the causes. Tabulating the 11,778 complaints of crimes against property handled by the detective bureau during the fiscal year 1915-16, the report found that no results were obtained in 10,154 of these cases, or 86.2 per cent. In these cases in which nothing was accomplished, losses involved amounted to \$303,744.14. The total recoveries made amounted to \$32,219.35, considerably less than one-third of the annual payroll of the bureau. The report found that "the number of men assigned to the detective bureau is far in excess of what a city of the population and area of San Francisco would normally employ, and the number of men assigned to the business office for the maintenance of records is almost equal to the number usually employed in the maintenance of all the records connected with a police department in a city of this size." The records of the bureau are found by the report to be worthless for the purpose of finding out anything about the efficiency of the detectives employed. While the charter limits the detective bureau to a captain and twenty-five detective sergeants, the detective service at present has three times as many men as the charter provides. In addition to this, twenty patrolmen are doing plain clothes service in the various police districts. The recommenda-

tions would repeal the charter provisions limiting the number of detectives to twenty-five and fixing their salary. They would cut the force down to a total of fifty-five, a captain, one lieutenant, three sergeants, fifteen senior detectives and thirty-five junior detectives receiving the pay of patrolmen. The municipal experts would send the rest of the detective bureau back to the sidewalk, and put the twenty plain clothes men in the police districts back on their beats. They would forbid the use of patrolmen for detective work except on the chief's staff. Three civilian clerks, they declare, could handle the record work.

The report would send every detective to school and make him complete successfully a course in detective training before he could apply for even the junior grade. At present, says the report, San Francisco's detectives know no more than patrolmen about detective work. The assignment of detectives to cases of felony where the arrest has been made by a uniformed policeman would be forbidden. The detectives would have to report at 8 a. m., instead of 9 a. m., for the morning line up of prisoners, so that time enough might be taken to review properly the records of criminals. They would also have to wear masks at the "line up." The senior detective in each of the five districts would be required to make a daily report of the activities of his squad. The captain of detectives would be required to make to the chief a daily consolidated report, and a weekly report to the chief and to the Commissioner of Public Safety recommended to replace the present Board of Police Commissioners. The bureau of identification would be cut down ruthlessly. The two patrolmen on the press clipping staff would be immediately relieved of their easy jobs and would be sent out. The expense of the photographic bureau, now costing \$14,460 a year, exclusive of pension liabilities, would be cut heavily by eliminating unnecessary exchange of photographs with other cities, as well as by making one photographer do the work. The photographer would be placed under the supervision of the Bertillon operator, and prohibited from giving copies of pictures to anyone, except on written order from the chief or the captain of detectives, stating the reasons. No one would be allowed to engage the photographer in work except by order of the Bertillon operator.

Fireman Killed in Truck Crash.

Lewistown, Pa.—George H. Wentz, of the Henderson fire company, was killed by being thrown from the company's auto in responding to an alarm. Schuyler Brought, who was at the wheel of the big machine, was obliged to make a wide turn at a corner in order to avoid an automobile which in defiance of the borough statute was moving down the street after the fire whistle had sounded. Persons who witnessed the mishap say that this was directly responsible for the resultant smashup. The snow rendered the brakes useless and the truck crashed into a telephone pole. The right side was crushed in by the impact. Several of the firemen were thrown from their places to the pavement, but all save Wentz escaped serious hurt. The ladders and other movable equipment of the truck were torn from their fastenings and scattered about the street. The dead man was one of the most active members of the Henderson company and was about 50 years old.

Building Inspector Killed by Fire Truck.

Flint, Mich.—City building and electrical inspector George D. Hanna, 40 years old, was so badly crushed under the wheels of the central fire company truck that he died half an hour later in the hospital. Hanna, whose offices were in the central station, made a run with the company to extinguish a small blaze. At the hydrant, Hanna jumped from the rear step just as two other members of the crew pulled off a line of hose. The driver reversed the machine and Hanna, in his attempt to get out of the way, tripped on the hose and fell. The heavy machine passed over his chest. Hanna was appointed in December, 1911.

All Companies Fight Chemical Blaze.

Camden, N. J.—One of the most spectacular and hazardous fires local men have had to battle with for months destroyed a large frame building of the General Chemical Company. Thousands of dollars' worth of pottery and

acids were consumed in the flames which caused a damage which will reach \$50,000. The flames spread with great rapidity from the start and gave the firemen a five-hour battle. A general alarm brought every company to the fire when the flames were discovered, and to add to the difficulties of the firemen, alarms were sent in to headquarters from boxes nearly two miles from the scene, drawing away several companies from the place of the big blaze. The fire broke out in the pottery department in a big frame building, just north of the railroad tracks. There was a terrific explosion which tore away a portion of the roof of the structure, which is 200 feet long and 100 feet wide, and is two stories high. The chemical plant is located in the heart of Camden's oil district. Pumping stations of a number of oil companies are adjacent. The firemen took their lives in their hands when they fought the flames in an alley to prevent them from spreading. Had the flames reached other buildings the whole section would have been doomed. Directed by Fire Chief Peter B. Carter and the deputy and battalion chiefs, the firemen put up a stiff fight. The firemen were handicapped by distance of plugs from the scene of the fire.

Two Firemen Hurt in Waterside Blaze.

New York, N. Y.—An obstinate fire in a dock storehouse in Brooklyn kept the firemen busy for almost twelve hours all through the night. The total damage amounted to \$100,000, and two firemen were hurt. Deputy Chief Lally said that his men had much difficulty in fighting the flames because of the pungency of the smoke. They worked in relays of a very few minutes. The origin of the blaze is unknown. The fire originated in a four-story brick structure used, largely, for the storage of the furniture of vessels. From the outset the fire seemed to be formidable, and ten fire companies and two fire boats were called out. The fire boat William J. Gaynor drenched the structure from the river side. The building is 200 feet long and 75 feet deep and it was filled from cellar to roof. Charles Duchman, a fireman, was badly injured and was taken to the hospital. Captain John Callahan, of engine No. 202, who was acting battalion chief of the Forty-eighth district, was on the third floor when he dropped through a hole in the floor below. He suffered a broken rib and possible internal

Forty-Six Burned in Convent Fire.

St. Ferdinand de Halifax, Que.—An appalling tragedy closed the old year in this little village near Lake William, in Megantic county, Quebec, when forty-five insane girls, inmates of a convent asylum, perished in the fire which destroyed the institution. One of the sisters who tried to rescue the inmates died in the attempt. Far away from any town large enough to have an effective fire force, the asylum had to depend on the slender resources of the village and its own staff for protection. The institution accommodated 180 girls, but besides the inmates there also were thirty girls studying in a building adjoining. All these escaped. The blazing convent, the insane inmates and outside the bitter cold of a 20 below zero night made attempts at rescue doomed to failure from the first. The girls were beyond control, and some leaped from high windows. The material damage is placed at \$200,000.

MOTOR VEHICLES

Motorizing Milwaukee.

Milwaukee, Wis.—The city's fire department is rapidly being motorized. The latest installation is of three new motor-driven pumping engines, of American-La France make. Each carries 1,250 feet of hose and has a pumping capacity of 800 gallons per minute. The city now owns eighteen pieces of motor fire apparatus, a chief's automobile and assistant chiefs' cars. Five years ago the city's apparatus was drawn by 230 horses. Since then sixty horses have been replaced. Chief Thomas A. Clancy says: "Motor-drawn apparatus is coming to be an absolute necessity. The population of the city has increased so rapidly during the five years that it is quite imperative that motors be installed. The addition of the new power has made it necessary to add but one new company during the five years."

New Apparatus Arrives.

Iron Mountain, Mich.—New motor fire apparatus, just purchased by the city, was inspected by the city officials of a number of towns along the route, when the truck was driven from Chicago to Iron Mountain, as a test. It is a White truck, 60 horsepower, combination chemical and hose. It can develop a 60-mile an hour speed and is equipped with Goodrich solid truck tires. Chief L. Lalonde, of Iron Mountain fire department, accompanied the truck.

Order New Truck.

Huntington, Ind.—Contract for an \$8,500 triple combination motor fire truck, from the American-LaFrance motor truck company has been awarded by the board of works. The contract stipulates that the truck be delivered 100 working days after the signing. The new truck is to be fully equipped. It will have a capacity of from 750 to 1,000 gallons a minute, and three lines can be used. Chemical extinguishers and ladders will be carried on the truck. After the truck arrives, two of the teams of the department will be sold.

GOVERNMENT AND FINANCE

Finances Under Commission and Council Forms.

Portland, Ore.—The cost of operating Portland's municipal government under the commission charter is estimated to have been less during the fiscal year 1916, ending November 30, than for any year since 1911, and to have been gradually decreasing ever since the commission charter went into effect. Actual expense of operating all the municipal departments decreased from \$2,786,187 in 1912, the last full year under the old councilmanic form of government, to \$2,315,204, showing a reduction of \$470,983 under commission government. In 1913 the expenditures of the various municipal departments were \$3,182,633, as against \$2,315,204 for 1916, showing a reduction in expense of \$867,429. The 1913 tax levy was made by the old council during the Rushlight administration, which also made the appointments to the various departments. The Rushlight administration was in office the first six months of 1913 and the commission form of government was inaugurated on July 1 of that year. During each succeeding year the actual operating expenses of the city have decreased. In 1914 they were \$3,078,240; in 1915, \$2,916,409, and in 1916 they dropped down to \$2,315,204. However, taxes have increased while the expenses have decreased. This situation is due to the fact that revenues to the general fund from sources other than taxation have fallen off many hundred thousand dollars a year. The city has lost the \$350,000 paid annually for liquor licenses. It also has lost \$400,000 to \$600,000 a year received for several years in 5 per cent. fees on all street and sewer improvements, exacted under a charter provision. Other license fees have dropped short of what they were formerly. Also the assessed valuation of property on which the annual tax levy is based has been decreasing in recent years. If the city now had the liquor license fees formerly collected and the 5 per cent. on street and sewer assessments collected during the time so many improvements were being made under the old councilmanic government, the general fund would be replenished each year by \$700,000 to \$800,000, and the tax levy could be reduced by 4 or 5 mills. Following is a comparative statement of the assessed valuation, receipts from taxation and other sources and actual expenditures, 1910 to 1916 inclusive:

Year—	Assessed Valuation.	Tax Levy, †	Amount Received from Taxes.	Receipts Other Sources Excluding Water Dept.	Operating Expenditures.
1910.....	\$231,161,600	4.9	\$1,092,280.93	\$840,486.74	\$2,110,380.90
1911.....	274,394,720	6	1,588,656.94	1,318,444.02	2,305,514.21
1912.....	296,199,230	6.73	1,922,373.32	1,190,443.65	2,786,187.72
1913.....	308,975,220	7.49	2,280,852.11	*872,502.44	3,182,633.46
1914.....	314,105,777	7.235	2,246,977.23	1,152,815.94	3,078,240.37
1915.....	307,918,080	6.857	2,068,984.94	**838,811.46	2,916,409.35
1916.....	303,002,530	8.20	1,955,743.97	503,311.63	2,315,204.84
Totals			\$13,155,869.44	\$6,717,115.88	\$18,694,570.85

*The reduction in miscellaneous receipts for 1913 is caused by the change in the fiscal year, showing only 11 months' receipts. The semi-annual installment of liquor license fees, amounting to over \$150,000, was collected in December of that year and is included in the receipts for the fiscal year 1914.

**The reduction for 1915 is largely due to the fact that prohibition went into effect and no liquor license fees were collected.

† Tax levy, exclusive of docks and firemen's relief.

Surrounded by Police, Mayor Swears in Appointees.

Newark, N. J.—Following the refusal of the Democratic common council majority to confirm his appointments, Mayor Raymond, a Republican, ignored the actions of the council and swore in his appointees himself, surrounded by a strong squad of police. The officials thus inaugurated were the fire, police and health boards and the city auditor. No attempt was made to forcibly take possession of the office of the latter. Only litigation can now determine the status of the new officials, as the council persists in rejecting the mayor's appointments. City Treasurer Elmer A. Day will refuse to recognize warrants issued by the new boards and there is no recognized auditor to approve bills. The mayor relied upon an opinion rendered by City Counsel Frazer, following a conference in the legal department, expressing approval of the construction placed upon the so-called "Ripper Act" of 1907, upon which the unusual proceedings were based. In his opinion, City Counsel Frazer said: "In view of the language of the act itself and the construction received from the court (the Court of Errors having affirmed the opinion of the Supreme Court), it is the opinion of the law department that there is vested in you the power to appoint members of the police and fire commissions, as well as the health board, and also the city auditor, without awaiting confirmation by the council." City Clerk Archibald was first consulted as to whether he would yield to the request of the mayor to administer the oaths, but would go no further than to turn over the oath book. He took the position that the appointments were subject to confirmation and that since the council had taken action he was without authority to swear in any of the appointees.

Ohio Cities Join for Financial Relief.

Columbus, O.—Mayors of twenty Ohio cities have finally agreed on four suggested changes in the taxation laws they will seek from the legislature this winter to help the cities out of their financial embarrassment. The changes proposed are: 1. Take the sinking fund and interest charges out of the 10 mill limit of the Smith law, but leave them inside the 15 mill limit. Provide the 15 mill limit may be exceeded any year when authorized by a vote of taxpayers. 2. Provide some methods by which political sub-divisions, under certain restrictions, may determine their own tax rate, such rate when so determined not to be subject to review by the county budget commission. 3. Return 50 per cent of the automobile license money to the cities and the political sub-division where paid. 4. Return 80 per cent of the state liquor license tax to the municipality where paid. These recommendations were placed in the hands of a committee composed of Mayor Thornton, of Youngstown, Mayor Laub, of Akron, and City Solicitor McKee, of Springfield, who submitted them to the state meeting of Chambers of Commerce to get the support of the organization. The first two recommendations are identical with those of the Ohio League of Municipalities. The recommendations, most of the mayors estimated, would clear the situation, so current expenses could be obtained from the taxation levies. The trouble is that many cities are facing heavy deficits and their borrowing capacity is practically gone. Cleveland, unless there is a change in the law, would face the certain deficit of not less than \$1,200,000 according to director of accounts Neal and city solicitor FitzGerald. That city has only a small remnant of its borrowing capacity left. The same is true of Canton, so Mayor Stolberg said.

For these two cities it was proposed to ask legislation to make somewhat more elastic the city borrowing capacity for a short period to meet a special embarrassment. The fear was expressed by several mayors that it might be difficult to get a change made in the Smith law because of the favor in which it was held by rural voters. Joseph J. Tracy, former head of the bureau of municipal accounting, said the law, as it was originally drafted by the author, Smith, was intended to make it possible for the ten-mill levy to be used for operation. The change that was being sought, he said, was merely restoring the Smith law to the original form. From nearly all the mayors came a demand for a redrafting of the taxation laws so more property could be put on the duplicate. The four recommendations were prepared by a committee composed of Mayors Laub, of Akron, Stoberg, of Canton, Lowry, of Mansfield, Milroy, of Toledo, and City Solicitor FitzGerald, of Cleveland.

Complete Codification of New York Ordinances.

New York, N. Y.—After nearly four years of work on the part of the codification committee of the Board of Aldermen, the city is now in possession of a code of ordinances complete in every detail. This complete codification of ordinances will be a great aid to judges and lawyers who heretofore have been put to much inconvenience because the measures enacted by the Board of Aldermen were not properly arranged or indexed. The code covers 658 pages, including 1,000 ordinances so indexed that any one of them, with amendments up to date, can be found with ease. It will be accepted by the courts as evidence, which means that it will no longer be necessary to submit certified copies of a particular ordinance to prove a case. This certification of ordinances has been in the hands of the corporation counsel, who had to employ extra men for this work. According to Aldermen Palitz, the codification will save the city at least \$10,000 a year, because of the fact that certification will no longer be needed, and that the department of the corporation counsel's office established for this purpose can now be eliminated.

STREET CLEANING AND REFUSE DISPOSAL

Citizens Must Sweep Sidewalks.

New York, N. Y.—The board of health has adopted a regulation providing that householders be held responsible for the sweeping of their sidewalks in the same manner they are held responsible for the removal of snow. Under the new regulation householders may sweep the dirt into the gutters between 6 and 8 o'clock in the morning, in time for the street cleaning department to remove it. If the sidewalks are swept after 8 o'clock the householder must place the sweepings into a receptacle; they must not go into the street.

City Wins Garbage Contract Bond Case.

Bridgeport, Conn.—The city scored a victory in a decision in which the Supreme Court of Errors found error in the decision of Judge Greene of the Superior court, who held that the city could not collect damages from the Aetna Indemnity company on a bond for \$10,000 given for the Bridgeport By-Products company which contracted to reduce the garbage of the city. After Judge Greene had given his decision against the city an appeal to the Supreme court was taken. In 1904 the city made a contract with George E. Winton for a period of 10 years to reduce the garbage of the city. Later the contract was turned over to the By-Products company and the Aetna company gave the bond. On May 6, 1910, J. B. Livingston, who was the head of the By-Products company, notified the city that the company on May 11 would cease reducing the garbage on the ground that considerable "foreign" matter was found in it which greatly damaged the machinery. Shortly before this notice was served Mr. Severance, who was behind the concern, brought foreclosure proceedings to recover on a mortgage. The city then made a contract with Charles C. Fischer to reduce the garbage and the By-Products company then

brought a \$200,000 damage suit against the city, claiming breach of contract. The local concern became insolvent and went into the hands of a receiver. The Superior court at Hartford appointed attorney James E. Wheeler of New Haven to take evidence. He found that the By-Products company was not justified in breaking its contract as the amount of foreign matter was not sufficient cause. When the contract with Mr. Fischer was made, the city was obliged to pay \$1 a ton for the reducing of the garbage. Under the contract with the By-Product company it paid but 50 cents. The committee held that under those conditions the city was damaged to the extent of \$20,867. But the committee held that as the garbage up to the time of the appointment of a receiver had been buried by John T. King at 50 cents a ton, the city did not lose anything and that no damages could be collected for the balance of the time which the By-Products company contract should have continued. Judge Greene held that as no damage had resulted to the city up to the time the receiver had been appointed, the city could not collect any damages. The appeal was then taken.

Cost of Operating Municipal Garbage Plant.

Atlanta, Ga.—Since the operation of the city crematory was taken over by the city the latter part of last May, the average cost per ton of incinerating garbage has been 82.1 cents, according to figures compiled by the sanitary department. During the operation of the plant by the private crematory, the cost of burning the garbage ran close to \$2 per ton, it being estimated that the total cost of operation was \$120 a day. The cost of 82.1 cents a ton represents the total cost of operating expenses, maintenance and all repair work on the plant since it was taken over by the city, but does not include the charges for interest on the money invested.

Street Sanitation in Milwaukee.

Milwaukee, Wis.—In the report of G. O. Davis, superintendent of street sanitation, of the department of public works, the total cost of street cleaning is given as \$150,138.61. Cost of snow removal was \$22,612.64 (November and December estimated). During the season 7,731 catch basins were cleaned, from which 7,906 loads of dirt were removed, being 15,812 cubic yards. The cost of this work was \$20,322.64; the average cost of cleaning a single basin was \$2.63 (November and December estimated). In 1914 this cost was \$3 per single catch basin; in 1915 this cost was \$2.69. Garbage to the amount of 68,928 loads was collected, the total weight being 30,050 tons. The total cost of collecting was \$118,500; average weight per load, 1,200 pounds; average cost of collection per ton was \$3.03 (November and December estimated). In 1914 this cost was \$2.94, and in 1915, \$2.87. Dead animals numbering 4,799 were collected. Cost of collection was \$1,772; collection per single animal was 37 cents (November and December estimated). During the year 111,573 loads of ashes and rubbish, or 344,719 cubic yards, were collected. Total cost of collection was \$219,209.89; average cost of removal per cubic yard was 64 cents (November and December estimated). In 1914 this cost was 70 cents per cubic yard and in 1915, 66 cents. During the season 162,777 miles of streets were oiled. The total cost of oiling was \$96,607.22; 719,694 gallons of oil were used. Last year only 122 miles of streets were oiled and in 1914, 114 miles were oiled. The total cost of sprinkling and flushing was \$67,125.32. Work done and assessed to property: Removing snow, \$8,940.47; removing earth, \$547.45; cutting weeds, \$5,943.27; removing dangerous trees, \$64.35; miscellaneous, \$994.14; total, \$16,489.68.

MISCELLANEOUS

Mayors Confer on High Cost of Living.

Schenectady, N. Y.—The high cost of living, with suggestions regarding procedure to bring about a reduction in the price of foodstuffs, was the theme of the New York State Conference of Mayors here. Voluminous data covering every phase of the food problem had been prepared for the information of the conference, and the subject was studied from all angles. The advisability of preparing a bill, de-

signed to result in lower food prices, for submission to the Legislature, also was considered. Mayor Lunn of this city presided at the conference. George W. Perkins of New York, chairman of the investigating commissions appointed both by Governor Whitman and Mayor Mitchel of New York, was one of the speakers. Others who participated in the proceedings included John J. Dillon, State Commissioner of Foods and Markets; S. J. Lowell, master of the State Grange; M. E. Burritt, State leader of County Agricultural Agents, and Mayors Mitchel of New York, Stevens of Albany, Stone of Syracuse, Edgerton of Rochester, Carlson of Jamestown, and Reed of Glens Falls.

The immediate creation of a state market department of proper size, scope and power, and in the cities of the state of departments of a similar character was urged by George W. Perkins in presenting before the conference the report on foods and markets of the Governor's Market Commission, Mayor Mitchel's Food Supply Committee, and the Wicks Legislative Committee. Such a department, Mr. Perkins stated, could see that the interests of the producer and consumer were protected from private greed and imposition in much the same way that the Public Service Commission safeguards the public's transportation interests. Such a broadened State Department of Markets would be headed by a single commission appointed by the governor, with full power to investigate the production, manufacture or sale of foodstuffs, and would consist of the Interstate Commission, the state commissioner, the New York City commissioner and four or six other commissioners to be appointed by the governor from different sections of the state to represent the farming, transportation and other interests. It was recommended that each municipality in the state be authorized to create adequate market departments. John J. Dillon, state commissioner of foods and markets, gave details of his plan to build a \$2,000,000 terminal market in New York City. The Dillon plan contemplates the opening of a farmers' collection house some place upstate, where all supplies will be delivered to a state agent. This food is to be graded as to quality, weighed and taken out of the hands of the farmer for sale at the highest price. It will then be shipped to the terminal market in the city, where it may go into the municipal cold storage plant, be reshipped abroad or sold to the local consumer. An official price bulletin to be published by the state is recommended as a part of the plan. It is proposed to make the market pay for itself from the first. This can be done, Mr. Dillon says, through the collection of a sliding commission, ranging from 3 to 5 per cent. Cost reduction will result from the elimination of the drummer, the city commission dealer, wholesalers and jobbers. Mr. Dillon is sure that the saving of these profits will pay for the original cost of the plan within the first two years.

Municipal Saloon Makes Money for Roads.

Baypoint, Cal.—From the year's profits of a municipal saloon the citizens of this town have started street improvement work to the extent of \$3,000. The saloon, which was opened two years ago by a lumber company owning the townsite, a year ago was given to the citizens with the provision that they should manage the bar. The entire proceeds go into street improvements.

Work of City Plan Commission.

Omaha, Neb.—The year's work of the city planning commission has been mainly getting a correct start to its activities. The appropriation of \$7,500 was expended for office salaries and supplies and fees of three experts, Messrs. Goodrich, Ford and Robinson, of New York. In May, 1916, regular offices were established in the city hall. The commission will ask the city council to appropriate \$25,000 for 1917. During the year J. E. George succeeded George Brandeis as member of the commission. The commission co-operated with the city council in working out the belt line track elevation scheme which was adopted by the city and accepted by the Missouri Pacific Railway Company. Three tentative plans for widening 24th street, Pacific to Cumming streets, have been prepared. This project will be taken up during the new year. The commission and its experts held several sessions with the city legal department

LEGAL NOTES

A Summary and Notes of Recent Decisions— Rulings of Interest to Municipalities

Inspecting Poles and Wires—Fees—Power of City.

(Colo.) While the city may not exact a fee for inspection of poles and wires if no inspection is necessary, it is for the council to say whether it is necessary.—Colorado Postal Telegraph Co. v. City of Colorado Springs, 158 P. 816.

Street Obstructions—Removal—Damages.

(N. Y. Supp.)—Where obstructions on a street were ordered removed, an abutting owner, injured, cannot recover on the theory that the injury was permanent, but can only recover for damages which accrued before institution of action.—Hellinger v. City of New York, 160 N. Y. S. 741.

Pensions—Upon Whom Conferred.

(Ill.)—Pension acts to be valid can only confer pensions upon persons who at the time of receiving them are officers or employees of the municipality.—People v. Abbott, 113 N. E. 696.

Method of Filling Vacancies—Length of Term.

(Ky.)—The power granted by Const. § 160, to the general assembly to prescribe how vacancies in municipal offices shall be filled does not include power to extend the length of time appointees thereto may serve; that being fixed by section 152.—Scott v. Singleton, 188 S. W. 302.

Establishment of Municipal Corporation—Appointment of Officers.

(W. Va.)—The constitution does not prohibit the legislature from establishing municipalities and providing for their government by officers to be appointed by the governor.—Booten v. Pinson, 89 S. E. 985.

Municipal Bonds—Validity.

(U. S. C. C. A.)—Where municipal bonds bore admittedly official signatures of municipal officers and city seal, such signatures and seal prima facie established validity of bonds.—Town of Newbern v. National Bank of Barnesville, Ohio, 234 F. 209.

Violation of Street Ordinance—Liability.

(Ohio.)—The violation of a municipal ordinance regulating use of streets by automobiles, passed in the exercise of a police power, is negligence per se, and when it is the proximate cause of an injury, the defendant is liable.—Schell v. Du Bois, 113 N. E. 664.

Encroachment—Nuisance—Remedy.

(N. Y. Supp.)—Where a private property holder encroaches beyond building line to injury of other abutting owners, his encroachment constitutes a private nuisance, and continuance may be enjoined.—Hellinger v. City of New York, 160 N. Y. S. 741.

Donation to Library—Public Money.

(Ga.)—A donation to library trustees of a city and accepted by them becomes public property, so that, if the trustees loan the money, the municipality cannot, by ordinance, release the borrowers from their obligation to pay the debt.—Tedder v. Walker, 89 S. E. 840.

Maintenance—Improper Design—Liability of Contractor.

(Ill.)—Where paving contractor agreed to maintain improvement in order for five years, city designing type of pavement and of track construction in rehabilitating street railway, contractor not being consulted, such contractor was liable only for defects resulting only from faulty character or quality of materials used or workmanship employed, not for defects caused by operation of heavier street cars than when first laid.—R. F. Conway v. City of Chicago, 113 N. E., 703.

in connection with proposed legislation for enlarging the powers of the city planners. Secretary Kvenild prepared a collection of eighteen data maps, showing distribution of sewers, street car tracks, pavements, parks, school population and other features of the city. A city planning exhibition was held in the court house.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Bituminous:

How An Amiesite Pavement is Laid. Description of work in Bethlehem, Pa. By Daniel J. Hauer. 2 ills., 2,500 words. The Contractor, Dec. 15. 20 cts.

Detailed Cost of Bituminous Surface Treatment Work at Philadelphia. 4 ills., 1,800 words. Engineering and Contracting, Dec. 6. 10 cts.

Method and Cost of Filling Joints in Bituminous Surface Concrete Pavements of Calif. 1 ill., 1,100 words. Engineering and Contracting, Dec. 6. 10 cts.

Brick:

Recent Developments in Pitch-Sand Mastic Fillers. An analysis of the changes made in the specifications as adopted by the A. S. M. I. concerning joint fillers. Some details as to how fillers should be applied are included. By J. S. Crandell. 3 ills., 1,200 words. Canadian Engineer, Dec. 7. 15 cts.

Method and Cost of Grouting Brick Pavements. Requirements of Ill. State Highway Department. Quantity of grout required per unit area. 1,750 words. Engineering and Contracting, Dec. 6. 10 cts.

Build Monolithic Brick Road on One-Inch Base. Narrow country road needs small size equipment and minimum of aggregate. 2 ills., 1,000 words. Engineering Record, Dec. 9. 15 cts.

Cost Records of Monolithic Brick Pavements. Details records of cost on paving job where brick was laid directly on green concrete. By Wm. Robt. Paige. 1 ill., 2,100 words. Engineering News, Dec. 28. 15 cts.

Brick Pavement on Two-Inch Base Laid for \$1.45½ Per Square Yard. On lightly traveled streets of Dwight, Ill., substantial saving was made by reducing thickness of foundation course. By P. E. Green. 3 ills., 4,000 words. Engineering Record, Dec. 30. 15 cts.

Relay Brick Pavement on Wet Concrete Cushion. Sunken places over trenches and sand flows obviated by monolithic construction reusing 17-year old bricks. 800 words. Engineering Record, Dec. 2. 15 cts.

Concrete:

Finishing Concrete Pavements. Discusses several methods, particularly that of using a canvas belt. By Stanley E. Bates. 1 ill., 1,200 words. The Contractor, Dec. 15. 20 cts.

Vibrating Concrete Makes Dense Mixture. Vibrolithic concrete laid at White Plains, N. Y. 5 ills., 900 words. Engineering News, Dec. 14. 15 cts.

Construction:

Concrete Road Construction in Michigan. Special machinery was employed in a new road built near Pontiac. Gravel-concrete was used and the employment of machinery for floating the surface and placing the expansion joint was unusual. 3 ills., 1,300 words. Engineering News, Dec. 7. 15 cts.

Slides in a Deep Street Cut. Grading difficulties in Kansas City. 1,000 words. Engineering News, Dec. 21. 15 cts.

Convict Labor:

Convict Labor on Highway Construction in Arizona. 2,000 words. Engineering and Contracting, Dec. 6. 10 cts.

Federal Aid:

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Finance and Management:

Comparative Analysis of Economic Effect of Road Improvement in 3 counties. Information as to the benefits and burdens imposed through the construction of improved road systems. 5,000 words. Engineering and Contracting, Dec. 6. 10 cts.

How Office Machinery for Spending a One and One-Half Million Dollar County Road Bond Issue Works. Graphic reports are posted in chief's office. Full force

accounts and early checking of extras minimize differences with contractors. 2 ills., 2,000 words. Engineering Record, Dec. 2. 15 cts.

Maintenance:

Methods and Cost of Resurfacing an Old Macadam Road with Rock Asphalt. By C. R. Thomas, Engr., Ky. State Public Road Dept. 7 ills., 3,500 words. Engineering and Contracting, Dec. 6. 10 cts.

Replacing Pavement Cuts. Practices of 28 cities in back filling trenches and repaving over them. Power tamping, flushing; reinforcing concrete base. 2,200 words. Municipal Journal, Dec. 21. 10 cts.

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Oil for Treating New Paving Blocks. Theory and operation of preservation of wood with creosote oil; injurious effect of steaming; expansion and its prevention. From a paper by P. C. Reilly. 3 ills., 2,500 words. Municipal Journal, Dec. 7. 10 cts.

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Bank Street, Ottawa, Subway Pavement. Review of drainage plan adopted in repaving subway. By L. McLaren Hunter. 3 ills., 700 words. Canadian Engineer, Nov. 30. 15 cts.

Sign Posts:

Improvements Made in Sign Posts for Roads. Data on economical and permanent types collected from highway and automobile organizations. 4 ills., 3,000 words. Engineering Record, Dec. 30. 15 cts.

SEWERAGE AND SANITATION.

Activated Sludge:

Activated-Sludge Results at Cleveland Reviewed. A comprehensive review of nearly a year's operation of one of the two largest activated-sludge plants in the United States. This article is on clarification. 2 ills., 4,900 words. By R. Winthrop Pratt & G. B. Gascoigne. Engineering News, Dec. 7. 15 cts.

Activated-Sludge Results at Cleveland Reviewed. The second of a series of articles. This deals with sludge removal. By R. Winthrop Pratt & G. B. Gascoigne. 1 ill., 4,800 words. Engineering News, Dec. 14. 15 cts.

Catch-Basins:

Economical Cleaning of Catch Basins. Motor truck fitter with dumping body and crane and grab bucket for removing mud. Comparison with old methods. By C. L. Edholm. 1 ill., 1,500 words. Municipal Journal, Dec. 14. 10 cts.

Concrete:

Concrete and Vitrified Pipe Sewers in Newark. Conclusions drawn from 12 years' experience. Ordinary sewage does not cause disintegration of cement. Abrasion of concrete and clay pipe equal. By Edwin S. Rankin, Engineer of Sewers. 4 ills., 1,700 words. Municipal Journal, Dec. 28. 10 cts.

Construction:

Binghampton Builds Interceptor with Four River Crossings. Construction details of sewers crossing two rivers. By A. L. LaRoche. 5 ills., 2,000 words. Engineering News, Dec. 28. 15 cts.

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Leakage Into a Sewer Outlet. Salt water seeping into a sewer at Rye, N. Y., greatly increases the cost of pumping and reduces the effectiveness of sprinkling filters. 1 ill., 750 words. Municipal Journal, Dec. 28. 10 cts.

Water Tight Sewers Desirable. Leaky sewers endanger health and increase cost of sewers, pumping and purification. Leaky house mains; remedy. 1,400 words. Municipal Journal, Dec. 28. 10 cts.

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Designing Storm Water Inlets. Calculating width of chamber so that water will not strike rear wall. Making provision for easy cleaning. By Harry F. Harris. 5 ills., 1,200 words. Municipal Journal, Dec. 21. 10 cts.

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The Work of the County Sanitary Engineer. His duties are outlined in a paper by L. A. Boulay. 2,000 words. Engineering and Contracting, Dec. 13. 10 cts.

Sewers:

Sewer Work in Texas. Figures showing plants in operation miles of sewer mains and types of plants. 1,100 words. Municipal Journal, Dec. 7. 10 cts.

Binghampton's Intercepting Sewer. Four inverted syphons at River Crossing. Cast-iron pipe are used for these and for other parts of the sewer. Details of syphon chambers and methods of construction. By W. Earl Weller, City Engineer. 8 ills., 3,000 words. Municipal Journal, Dec. 28. 10 cts.

Neponsit Sewerage System. Cast-iron pipe used for sewer mains. Method of making house connections. Pumping and treatment plants. By A. J. Provost. 2 ills., 1,600 words. Municipal Journal, Dec. 28. 10 cts.

Surveying for the Milwaukee Intercepting Sewers. Field methods in subsurface structures. By D. W. Townsend. 1 ill., 750 words. Engineering News, Dec. 28. 15 cts.

Building Newtown Creek Siphon. Terminal chamber constructed in wooden pneumatic caisson and siphon pipe hauled to position under water. Concrete shaft sunk with dredge caisson. 3 ills., 1,500 words. Contracting, December. 10 cts.

Tests:

Tests of Sewer Pipe. Tests of cement and vitrified clay pipe made at Tacoma, Wash. Results. 800 words. Municipal Journal, Dec. 28. 10 cts.

Tile:

How To Get Best Results With Tile Drainage. By W. C. Curd. 1,000 words. Engineering Record, Dec. 9. 15 cts.

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Wayne Sewage Disposal Works After Nine Years' Use. Performance of old plant first designed by Col. Waring and revised nine years ago. 2 ills., 3,000 words. Engineering News, Dec. 21. 15 cts.

Sewage Disposal Methods of Sixteen Cities. 4,000 words. Engineering and Contracting, Dec. 13. 10 cts.

Experience and Results of Four Years of Operation of Coarse Screens, Grit Chambers, Imhoff Tanks and Trickling Filters at Atlanta, Ga. 3,500 words. Engineering and Contracting, Dec. 13. 10 cts.

WATER SUPPLY.

Cleaning:

Scotch Method of Cleaning Water Mains. Town engineer of Ayr tells in detail how work is done and gives cost. 2,600 words. Canadian Engineer, Dec. 21. 15 cts.

Construction:

Pipe Laying by Steam Shovel. Trench dug and pipe handled and lowered into it by steam shovel, which also laid its own platform and in many cases cleared the right of way, pulling up trees, fence posts and other obstructions. Details of work and cost. 5 ills., 1,200 words. Municipal Journal, Dec. 14. 10 cts.

The Wilson Avenue Tunnel, Chicago. Tunnel driven under Lake Michigan by city forces more cheaply than by contract. Special methods of handling muck and mixing and placing concrete lining. Efficient ventilation system and summary of plant installed: cost of sinking rock shaft. 4 ills., 3,000 words. Contracting, December. 10 cts.

Bids Asked Before Bonds Were Voted to Show That Estimated Cost Represented Real Cost of Pipe Line. On a job costing \$350,000, \$25,000 was refunded to the city. Water works system with high pressure service was constructed without pumps or elevated tank. By H. A. Rands. 4 ills., 2,200 words. Engineering Record, Dec. 9. 15 cts.

Serious Settlement Destroys Part of New Filter Plant. Details of the cracking due to settlement of a new and as yet unused municipal filtration plant at Cleveland. 6 ills., 3,000 words. Engineering News, Dec. 7. 15 cts.

Design:
Higher Unit Stresses for Pipe and Computation of Water Hammer Pressure Advocated. Design of heavy steel pressure pipe lines can be made more economical by proposed method which is outlined in detail. By B. M. Jones. 2,000 words. Engineering Record, Dec. 30. 15 cts.

Water Hammer Problems Solved by the Use of Alignment Charts. This article suggests a graphical solution of Joukovsky's and Allievi's formulas. By R. L. Hearn. 4 ills., 2,000 words. Canadian Engineer, Dec. 7. 15 cts.

Electrolysis:
Effect of Electrolysis on Pipes. Discussion at meeting of New York Section of A. W. W. A. 1,500 words. Fire and Water Engineering, Dec. 27. 10 cts.

Filtration:
Labor Costs of Constructing an Underground Pumping Plant. By H. E. Ferriss. 1 ill., 1,250 words. Engineering and Contracting, Dec. 13. 10 cts.

Water Filtration Experience. Deals interestingly with the development of water filtration practice with special reference to the mechanical type of filters. From a paper by H. G. Hunter. 3 ills., 3,000 words. Canadian Engineer, Dec. 21. 15 cts.

Water Filtration Experience. Second installment. This describes controlling and operating devices, design of building, etc. By H. G. Hunter. 3,300 words. Canadian Engineer, Dec. 28. 15 cts.

New Filtration Plant for Baltimore. Description of system. 3 ills., 1,000 words. Fire and Water Engineering, Dec. 13. 10 cts.

Report on Filtration for Calgary. Favors an all-year filtration, but doubts the ability of the city to finance this. By G. W. Craig, City Engr. 2 ills., 2,000 words. Canadian Engineer, Nov. 30. 15 cts.

Finance:
An Accounting System for Water Departments. 4 ills., 3,000 words. Fire and Water Engineering, Dec. 13. 10 cts.

Leakage:
Leakage from Pipe Joints. Points the necessity for thoroughly testing pipes for water tightness when laying. By F. A. Barbour. 1,500 words. Canadian Engineer, Dec. 21. 15 cts.

Tests of Lead Caulked Pipe Joints. Results of tests made during the construction of the water supply system of Port Arthur, Ont. 1 ill., 1,000 words. Engineering and Contracting, Dec. 13. 10 cts.

Management:
Should All Water Taps Be Metered and a Minimum Rate Charged? By Jos. C. Beardsley. 2,500 words. Fire and Water Engineering, Dec. 20. 10 cts.
Records of Water Mains and Valves. Necessity for keeping them is shown by the experience of Aberdeen, S. Dak. By Frank Lecocq, City Engineer. 1,000 words. Municipal Journal, Dec. 7. 10 cts.

Purification:
Progress of Water Purification. Abstract from general reports of cities issued by the Census Bureau. 1,750 words. Fire and Water Engineering, Dec. 6. 10 cts.

Water for Steam Boilers. Discusses the quality of water generally supplied and the results when improper water is used. 800 words. Municipal Journal, Dec. 14. 10 cts.

Method of Purifying Boiler Feed Waters. Discusses water treatment method and describes typical purifying plants at gas works. Considers boiler compounds for small works. By W. H. Fulweiler. 7,000 words. American Gas Light Journal, Dec. 25. 10 cts.

Reservoirs:
Reservoir Capacity Increased and Construction Cost of Dam Decreased by Hydraulic Sluicing. Saving in operating cost resulting from new source of supply is estimated to pay for extending water works system at Athens, Ga. 7 ills., 1,500 words. Engineering Record, Dec. 9. 15 cts.

New Reservoir to be Built Inside Old One That Failed. Designs completed for reconstruction at Cleveland filter plant where concrete basin roof collapsed. 2 ills., 1,500 words. Engineering Record, Dec. 9. 15 cts.

A City River Control Reservoir and Plans for Operation. Reservoir, Youngs-

town, O., just completed. 2 ills., 1,100 words. Engineering News, Dec. 7. 15 cts.

Surge-Tanks:
Surge-Tank Problems Solved by New Methods. Simplified analysis of oscillations of water surface in standpipe makes use of calculus unnecessary. By A. G. Hillberg. 1 ill., 2,000 words. Engineering Record, Dec. 23. 15 cts.

Water Works:
New Westminster Water Works Construction. Detailed description of the design and construction of adequate water supply. This article deals with valve arrangements, intake and cost. By J. W. B. Blackman. 6 ills., 4,000 words. Canadian Engineer, Dec. 7. 15 cts.

Saskatoon Water Works: Supply and Distribution. Discusses plant and rates. 1 ill., 1,200 words. Canadian Engineer, Dec. 14. 15 cts.

Woodstock Water Works. Special reference is made in this article to two devices. One controls the valve in the delivery main and the other is a water level alarm which shows when reservoir is full. By R. O. Wynne-Roberts. 3 ills., 2,000 words. Canadian Engineer, Dec. 28. 15 cts.

Wells:
The Advantages of Large Wells for Irrigation and Methods of Drilling 30 to 36-Inch Wells. 3 ills., 5,000 words. Engineering and Contracting, Dec. 13. 10 cts.

Well-Unit Water Supply at Aurora, Ill. Details of electric unit pump. 3 ills., 1,700 words. Engineering News, Dec. 14. 15 cts.

STREET LIGHTING AND POWER.

Some Developments in the Electrical Industry During 1916. Describes the prominent features of the more important development during the past year and indicates their influence on the designing as well as the manufacturing trend throughout the industry. By John Liston. 43 ills., 27 pages. General Electric Review, January. 20 cts.

Construction:
Installation of a 13,000-foot Submarine Power Transmission Cable. Laid across the Golden Gate, San Francisco Bay. 2,500 words. The Contractor, Dec. 15. 20 cts.

Trenching and Laying a Large Cast Iron Gas Main. On this job a cable-way trenching outfit and other labor saving machinery were used. By Daniel J. Hauer. 1 ill., 1,500 words. The Contractor, Dec. 15. 20 cts.

Cooking:
Gas vs. Electricity for Cooking Purposes. Advantages claimed by each, costs. From a paper by S. C. Bratton. 1 ill., 4,000 words. Gas Age, Dec. 1. 20 cts.

Management:
Power-Plant Efficiency. Attention is called to the preventable wastes in power plants, especially of the smaller or industrial types and the means that may be employed to prevent these losses. By Victor J. Azbe. 5 ills., 5,000 words. Power, Dec. 26. 5 cts.

FIRE.

Relation of State Fire Marshals to Fire Prevention Associations. From a paper by W. E. Longley, State Fire Marshal of Ind. 1,800 words. Fire and Water Engineering, Dec. 27. 10 cts.

The Relation of State Fire Marshals to Local Fire Department. By F. E. Henderson, Chief, St. Louis, Mo. 1,200 words. Fire and Water Engineering, Dec. 6. 10 cts.

Demotion of Chief Officers. Court holds that economy is sufficient ground for reduction in rank. 800 words. Fireman's Herald, Dec. 23. 5 cts.

Causes:
Spontaneous Ignition Studied by Means of Photographic Plates. By Frederick J. Hoxie. 1,200 words. Fire and Water Engineering, Dec. 27. 10 cts.

Motor Apparatus:
Deficiencies of Motor Apparatus. The writer contends that the apparatus builders have not been alive to opportunities and have clung too closely to old ideas. 1,200 words. Fireman's Herald, Dec. 16. 5 cts.

Motorization in New York. More than \$1,000,000 asked so that all horse-drawn vehicles may be replaced by motor apparatus. 1,000 words. Fireman's Herald, Dec. 9. 5 cts.

The Speed of Fire Apparatus. By F. W. Shepperd. 800 words. Fire and Water Engineering, Dec. 6. 10 cts.

Prevention:

Safety in School Buildings. Minimum requirements for safeguarding schools. The Ohio law and its regulation. By B. E. Buckley, Ohio State Fire Marshal. 1,500 words. Fireman's Herald, Dec. 2. 5 cts.

Protection:

Practical Fire Fighting. Questions asked in a New York Fire Dept. promotion examination with answers prepared for the instruction of members of the department. 1,000 words. Fireman's Herald, Dec. 2. 1,000 words, Dec. 9. 1,000 words, Dec. 16. 1,000 words, Dec. 23. 5 cts, each.

The Fire Protection of Buffalo. Abstracted from a report of the National Board of Fire Underwriters. 2,000 words. Fire and Water Engineering, Dec. 20. 10 cts.

New Phases of Fire Department Work. From an address by Robt. Adamson, Fire Comr. of New York City. 2,000 words. Fireman's Herald, Dec. 16. 5 cts.

New phases of Fire Department Work. By Robt. Adamson, Fire Comr. of New York. 2,000 words. Fire and Water Engineering, Dec. 20. 10 cts.

Progress of Platoons. Two platoons for Scranton; other cities contemplate changes to the two platoon system. 1,000 words. Fireman's Herald, Dec. 23. 5 cts.

Sprinklers:

Automatic Sprinklers. Details of construction. 1,100 words. Fire and Water Engineering, Dec. 6. 10 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Flushing:

Flushing Streets from Trolley Cars at Worcester, Mass. Company contracts with city to sprinkle and flush streets from trolley cars. Gives comparative costs of method. 3 ills., 1,300 words. Engineering News, Dec. 28. 15 cts.

Garbage Collection:

Methods of Garbage Collection. Describes the methods employed in 36 cities of more than 10,000 population; city or contract; frequency; cost per capita. 1,300 words. Municipal Journal, Dec. 7. 10 cts.

Refuse Disposal:

Waste Disposal for Small Municipalities. Discusses methods of collection. Disposal by dumping, burying, reduction and incineration; Classification of incinerators and cost of incineration. From a paper by W. F. Morse. 3,750 words. Municipal Journal, Dec. 14. 10 cts.

Ishpeming's Garbage Incinerator. Description of incinerator having capacity of 12 tons in 10 hours. Method of collection and cost of operation. 1,400 words. Municipal Journal, Dec. 14. 10 cts.

Snow Removal:

Snow Removal from Sidewalks. Ordinances concerning this in New York, Detroit, Buffalo, Milwaukee, Newark, Providence, Columbus, Grand Rapids and Montreal. By Andrew L. Bostwick. 1,500 words. Municipal Journal, Dec. 21. 10 cts.

Mobilization of Private Vehicles May Solve City Snow Removal Problem. Plans of Fifth Ave. Coach Co. 3 ills., 2,000 words. Commercial Vehicle, Dec. 15. 20 cts.

Street Cleaning:

Some Street Cleaning Figures. Amount of sweepings collected per thousand square yards of street area and of sweeping done. 750 words. Municipal Journal, Dec. 7. 10 cts.

TRAFFIC AND TRANSPORTATION.

A \$100,000,000 Rapid Transit Development for Chicago. Outline of work during three-year periods. 2,000 words. Engineering and Contracting, Dec. 20. 10 cts.

Changes Suggested in Traffic Census Forms. Standards of A. S. M. I. held to be unsuitable for city work. Forms used in N. Y. City explained. By D. B. Goodsell. 3 ills., 1,000 words. Engineering Record, Dec. 16. 15 cts.

Proposed Ontario Traffic Regulations. Legislature has been asked to adopt 10 rules tending toward greater safety. 1,800 words. Canadian Engineer, Nov. 30. 15 cts.

Street Traffic Regulation in Relation to Public Safety. From a paper by W. P. Eno. 1,200 words. Safety Engineering, December. 25 cts.

GOVERNMENT AND FINANCE.

Legality of Zone Ordinances. Decisions by the courts of several states concerning the rights of cities to prohibit certain commercial uses of property in residential sections. From a paper by W. F. Meier. 3,500 words. Municipal Journal, Dec. 14. 10 cts.

Side Lights on Depreciation Troubles of Utilities. The first of two articles giving a review of many meanings applied to "depreciation." By Harry Barker. 3,100 words. Engineering News, Dec. 21. 15 cts.

Side Lights on Depreciation Problems of Utilities. The second of two articles. Reviews schemes for figuring depreciation. By Harry Barker. 4,800 words. Engineering News, Dec. 28. 15 cts.

Keeping Cost Data on Municipal Work Carried Out by Day Labor. Some useful hints are given for adequately keeping records of time and material used in doing municipal work. By A. E. Foreman. 5 1/2 ills., 4,000 words. Canadian Engineer, Dec. 14. 15 cts.

Forms for Time-Keeping. Describes and illustrates improved forms in use by railroad and municipal contractor with the method of handling and filing the slips. 2 1/2 ills., 500 words. The Contractor, Dec. 1. 20 cts.

MOTOR VEHICLES.

Mileage Used as a Basis for Computing Depreciation. The value of Automobile and Motor Truck of given cost and size written off at rate based on probable mileage. By A. E. Phillips. 1 1/2 ills., 1,000 words. Engineering Record, Dec. 15. 15 cts.

Tractive Resistance Tests With an Electric Motor Truck. Results of tests made at M. I. T. to determine tractive resistance on various kinds of roads and under various conditions of maintenance. 2 1/2 ills., 3,000 words. Engineering and Contracting, Dec. 20. 10 cts.

Road Resistance Tested by Motor Truck Runs. Results of experiments show relative values of many types of surfacing for delivery wagon service. 3 1/2 ills., 1,200 words. Engineering Record, Dec. 23. 15 cts.

Highway Engineers Discuss Various Phases of the Motor Truck Legislation Problem. Opinions on the preservation of highways by controlling the vehicles which use them. 1,800 words. Engineering Record, Dec. 16. 15 cts.

365-Day Operation of Motor Trucks. Trucks can be used to haul coal during the winter. By Stanley E. Bates. 7 1/2 ills., 1,700 words. The Contractor, Dec. 1. 20 cts.

Motor Truck for Excavating, Back-filling and Tamping Trenches. 3 1/2 ills., 700 words. Engineering and Contracting, Dec. 20. 10 cts.

Turntable Dump Saves Time of Motor Trucks. Carrying dirt from building excavations, trucks pulled trailers during day time, while street congestion reduced speed. 2 1/2 ills., 1,000 words. Engineering Record, Dec. 23. 15 cts.

BRIDGES AND DAMS.

Dams: Plan for Raising the Height of Morena Dam. Will increase capacity and decrease danger of overtopping by adding five feet. 1 1/2 ills., 900 words. Engineering News, Dec. 14. 15 cts.

Method of Constructing the Calvaras Hydraulic Fill Earth Dam. 3,000 words. Engineering and Contracting, Dec. 20. 10 cts.

Worcester's Pine Hill Dam. Describes the construction of cyclopean concrete dam. Work is done by city by day labor. Construction plant details. By Ellis H. Custer. 4 1/2 ills., 3,000 words. Municipal Journal, Dec. 21. 10 cts.

New Multiple-Arch Dams in the Sierra Nevada. Two large concrete dams of special multiple arch type in which the circular arch changes to ellipse near the top to take care of changed stresses are described. 5 1/2 ills., 1,200 words. Engineering News, Dec. 21. 15 cts.

Bridges: Discuss Illinois Bridge Specifications. 1,800 words. Engineering Record, Dec. 2. 15 cts.

Proposed Specifications for Highway Bridges. Report of the committee appointed by the C. S. C. E. for the purpose of preparing revised specifications covering highway bridges. These apply to steel bridges with or without electric cars. 1 1/2 ills., 2,600 words. Canadian Engineer, Dec. 21. 15 cts.

Some Interesting Examples of European Concrete Bridge Designs. By Albert M. Wolf. 9 1/2 ills., 1,200 words. Engineering and Contracting, Dec. 27. 10 cts.

Ten-span Concrete Arch Bridge Near Columbus, Ohio. Description of details in design and erecting the modern reinforced concrete bridge. By E. P. Knollman. 5 1/2 ills., 2,100 words. Engineering News, Dec. 14. 15 cts.

Detailed Cost of 113-foot Reinforced Concrete Through Girder Bridge Built Near Douglas, Ariz. 2 1/2 ills., 6,000 words. Engineering and Contracting, Dec. 27. 10 cts.

Lake Quinsigamond Bridge. Describes the construction methods employed on a ribbed-arch, spandrel-column concrete bridge. Materials were handled by means of a construction track on a parallel trestle. By Ellis H. Custer. 3 1/2 ills., 1,500 words. Municipal Journal, Dec. 7. 10 cts.

New Type of Concrete Floor on St. Louis Bridge. Steel forms for concrete floor left in place. Were cheaper than removable wood forms. 3 1/2 ills., 1,300 words. Engineering News, Dec. 28. 15 cts.

Contractor Discusses Bridges Damaged by Flood. N. Car. floods show that concrete piers break under side pressure at end of day's work. 1,000 words. Engineering News, Dec. 28. 15 cts.

Timber-Incased Concrete Caisson to Be Sunk 142 Feet for New London Bridge. Special arrangements for guiding. 6 1/2 ills., 2,500 words. Engineering Record, Dec. 16. 15 cts.

Special Details in Erection Reduced Secondary Stresses in Longest Simple Trusses. Phosphor-bronze bearing blocks and steel castings allow rotation in two directions. 4 1/2 ills., 1,500 words. Engineering Record, Dec. 23. 15 cts.

Approaches of Bloor Street Viaduct, Toronto, Have Concrete-Covered Steel Frames. By W. F. B. Rubidge. 6 1/2 ills., 1,500 words. Engineering Record, Dec. 9. 15 cts.

Completing the Municipal Bridge at St. Louis, Mo. The last link in the bridge over the Mississippi is the three-mile approach viaduct at the east end. Its design and construction by city forces are described. 4 1/2 ills., 1,800 words. Engineering News, Dec. 14. 15 cts.

MATERIALS OF CONSTRUCTION.

Water the Chief Factor in Making a Good Concrete. Researches on cement and on aggregate are now supplemented by new knowledge. Suggestion is made that lighter portions of mixture be wasted to eliminate laitance. By Nathan C. Johnson. 7 1/2 ills., 5,000 words. Engineering Record, Dec. 20. 15 cts.

Concrete Construction in Winter. Gives many practical hints and suggestions. 3,000 words. The Contractor, Dec. 1. 20 cts.

Hand and Machine Placed Mortars. Shows the many and varied uses to which gunite can be put in engineering and contracting work. By B. C. Collier. 10 1/2 ills., 5,000 words. Canadian Engineer, Dec. 28. 15 cts.

A Well Designed Plant for Concrete Foundation Work. Machines are few and light, but handle the job efficiently. 2 1/2 ills., 1,000 words. The Contractor, Dec. 15. 20 cts.

Concrete Train for Street Railway Work. Used on Detroit Railway. 2 1/2 ills., 500 words. Engineering News, Dec. 14. 15 cts.

Design and Construction Features of Large Reinforced Concrete Girder. By Otto F. Fischer. 11 1/2 ills., 2,500 words. Concrete, December. 20 cts.

Economical Form Construction. From a paper by Sanford E. Thompson. 1,200 words. Concrete, December. 20 cts.

Recommended Specifications for Reinforced Concrete Design. Recently issued by Portland Cement Association. 5,000 words. Engineering and Contracting, Dec. 27. 10 cts.

Building Concrete Slab Cover for 19-Mile Ditch. Earth cushion protects concrete from falling boulders. By A. C. Francis. 1 1/2 ills., 800 words. Engineering Record, Dec. 9. 15 cts.

MISCELLANEOUS.

Dominion Land Survey Monument. Shows the various changes in the character of the monuments that have been used since 1871. By H. L. Seymour. 3 1/2 ills., 1,700 words. Canadian Engineer, Nov. 30. 15 cts.

Rectangular Wooden Flumes. Details of methods of designing wooden flume as used in Western irrigation work. By J.

C. Stevens. 1 1/2 ills., 3,000 words. Engineering News, Dec. 21. 15 cts.

Camera's Use on Engineering Work Worth Learning. Choice of camera and lens important. Directions in exposing film. By H. C. Campbell. 5 1/2 ills., 2,500 words. Engineering Record, Dec. 2. 15 cts.

Rainfall Data Interpreted by Laws of Probability. Practical application of probability methods to rainfall problems. By Thorndyke Saville. 2 1/2 ills., 3,900 words. Engineering News, Dec. 28. 15 cts.

Concrete-Revetment Machine for the Mississippi. A large experimental machine will soon be used in actual underwater bank paving work. By E. M. Markham. 6 1/2 ills., 3,100 words. Engineering News, Dec. 7. 15 cts.

New Center-Cut Methods Avoid Vertical Side Face in Bad Rock on New York Subway Work. 5 1/2 ills., 4,000 words. Engineering Record, Dec. 23. 15 cts.

Machine Trenching for Telephone Conduits. Shows the adaptability of trenching machines for this purpose. 1 1/2 ills., 1,200 words. Engineering News, Dec. 7. 15 cts.

Tunneling in Firm Clay with Compressed Air. 15 pounds of air was used in clay 76 feet below water level, working without a shield. 1 1/2 ills., 2,000 words. Engineering News, Dec. 28. 15 cts.

Sub-Aqueous Concrete Revetment for the Protection of River Banks. Describes work along the Mississippi River. From a paper by E. M. Markham. 1 1/2 ills., 4,500 words. Engineering and Contracting, Dec. 20. 10 cts.

Dredging Equipment for Any Contract Should Be Chosen to Fit Exactly the Conditions Expected. If a job does not justify installation of proper equipment, it does not justify a bid. By Arthur M. Shaw. 4 1/2 ills., 4,000 words. Engineering Record, Dec. 16. 15 cts.

New Municipal Docks at St. Louis. Structural details of docks just being constructed by city. 2 1/2 ills., 700 words. Engineering News, Dec. 28. 15 cts.

Civil Service for Junior Engineer. 1,000 words. Held by U. S. Civil Service Commission. Engineering News, Dec. 7. 15 cts.

Street Railway Track Without Spikes or Bolts. Steel ties with lugs are used. 3 1/2 ills., 800 words. Engineering News, Dec. 28. 15 cts.

The Priming of Charges and Firing of Blasts. Shows methods of preparing cartridges for blasting and for making connections for electric firing. By Thos. M. Knight. 8 1/2 ills., 2,000 words. Engineering and Contracting, Dec. 20. 10 cts.

Method of Reducing Seepage Losses in an Irrigation Canal Through Porous Shale. 1 1/2 ills., 2,500 words. Engineering and Contracting, Dec. 13. 10 cts.

Town Planning: The Laying Out of Curves. Illustrates and describes a design which facilitates the computing of curves. By H. L. Seymour. 6 1/2 ills., 3,000 words. Canadian Engineer, Dec. 21. 15 cts.

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NEWS OF THE SOCIETIES

Calendar of Meetings.

Jan. 10-13.—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. Annual convention, New York, N. Y. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Jan. 15.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York, N. Y. Secretary, F. A. Molitor, 35 Nassau Street, New York, N. Y.

Jan. 17-18.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, New York, N. Y. Secretary, Charles Warren Hunt, 220 West 57th Street, New York, N. Y.

Jan. 18-19.—AMERICAN FORESTRY ASSOCIATION. Annual convention, Washington, D. C. Executive Secretary, P. S. Ridsdale, 1410 H Street, N. W., Washington, D. C.

Jan. 18-19.—INDIANA ENGINEERING SOCIETY. Annual meeting, Lafayette, Ind. Secretary, Charles Brossman, 1616 Merchants' Bank Building, Indianapolis, Ind.

Jan. 19.—AMERICAN SOCIETY OF ENGINEERING CONTRACTORS. Annual meeting, New York, N. Y. Secretary, J. R. Wemlinger, South Ferry Building, New York, N. Y.

Jan. 20.—WESTERN PAVING BRICK MANUFACTURERS' ASSOCIATION, Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Bldg., Kansas City, Mo.

Jan. 22-23.—NATIONAL CIVIC FEDERATION. Annual meeting, New York City. Secretary, D. L. Cease, Metropolitan Tower, New York, N. Y.

Jan. 23-25.—CANADIAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, Montreal, Can. Secretary, C. H. McLeod, 176 Mansfield St., Montreal.

Jan. 23-25.—AMERICAN WOOD PRESERVERS' ASSOCIATION. Annual meeting, New York City. Secretary, F. J. Angier, B. & O. Mt. Royal Sta., Baltimore, Md.

Jan. 25.—MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH. Annual meeting, Boston, Mass. Secretary, Dr. Francis H. Slack, Health Department, Boston, Mass.

Jan. 25-26.—ILLINOIS SOCIETY OF ENGINEERS. Annual convention, Chicago, Ill. Secretary, E. E. R. Tratman, Wheaton, Ill.

Jan. 31-Feb. 2.—OHIO ENGINEERING SOCIETY. Annual meeting, Ohio State University, Columbus, O. Secretary, John Laylin, Norwalk, O.

Feb. 5-12.—AMERICAN ROAD BUILDERS' ASSOCIATION. Seventh American Good Roads Congress and Eighth National Good Roads Show, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 7-9.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Midwinter convention, New York City. Secretary, F. J. Hutchinson, 33 West 39th St., New York City.

Feb. 7-9.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual meeting, Minneapolis, Minn.

Feb. 7-15.—TENTH CHICAGO CEMENT SHOW, Coliseum, Chicago, Ill. Secretary, Blaine S. Smith, 210 South La Salle Street, Chicago.

Feb. 8-10.—AMERICAN ASSOCIATION OF ENGINEERS. National convention, Hotel La Salle, Chicago, Ill. Headquarters, 29 La Salle Street, Chicago.

Feb. 8-10.—AMERICAN CONCRETE INSTITUTE, Hotel La Salle, Chicago, Ill. Secretary, Harold D. Hynds, 1413 Walnut Street, Philadelphia, Pa.

Feb. 9.—TEXAS TOWN AND CITY PLANNING ASSOCIATION. Semi-annual convention, Sherman, Tex. Secretary, J. E. Suratt, Secretary Chamber of Commerce, Sherman.

Feb. 12-14.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Chicago, Ill. Secretary, E. S. Hanson, 538 South Clark Street, Chicago, Ill.

Feb. 15-16.—WISCONSIN ENGINEERING SOCIETY. Annual meeting, Madison, Wis. Secretary, L. S. Smith, 939 University Ave., Madison.

Feb. 19-24.—SOUTHWESTERN CONCRETE ASSOCIATION. Annual meeting and concrete show, Convention Hall, Kansas City, Mo. Chairman, Show Committee, Chas. A. Stevenson, 1433 West 10th Street, Kansas City, Mo.

May 8-10.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Washington, D. C. Secretary-treasurer, Franklin H. Wentworth, 87 Milk Street, Boston, Mass.

Nov. 12-16.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, 469 Transportation Building, Chicago, Ill.

Indiana Engineering Society.

The annual meeting of this society will be held January 18 and 19 at the Electrical Building, Purdue University, Lafayette, Ind. The program is as follows:

Thursday, January 18, 2:00 P. M.:—Report of Secretary; Report of Executive Committee; Address of Welcome by Prof. W. E. Stone, Pres. Purdue University, and Prof. W. K. Hatt; President's Address, Prof. L. W. Wallace, Pres. I. E. S.; Appointment of Committees; Address by General Anson Mills, Washington, D. C.; Financial and Ethical Status of the Engineer, Prof. Newell; Paper on Electric Lighting, Prof. Topping; Street Lighting in Small Towns, Samuel B. Mott; Report of Committee on Electrical Engineering and Electric Railways; The Vincennes Tract & Freeman Survey, Geo. R. Wilson, former Surveyor Dubois County; Report of Committee on Surveying & Drainage.

7:30 to 10 P. M.:—Inspection of Engineering Laboratories Purdue University. (Shops will be in full operation by students.)

Friday, January 19th, 9:00 A. M.:—Report of Committee on Mechanical Engineering, E. H. Ahara; Human Engineering, E. B. Smith, Marion, Ind.; Proportions of Modern Locomotive, W. A. Austin, Chicago, Ill.; Results of Experiments to Determine Belt Slippage and Pulley Windage in Power Transmission, Prof. L. V. Ludy; Report of Committee on Appraisal; Cases Before the Public Service Commission During the Past Year, H. O. Garman; Report of Committee on Legislation.

2:00 P. M.:—Cost of the Utilities of Rate Investigation, Chas. E. Hurd, Indianapolis, Ind.; Public Utility Lines, Peter Jundersfield; Spark Method of Selecting Steels for Industrial Purposes, J. F. Keller, Lafayette, Ind.; Cost Accounting, Harrington Emer-

son; Report of Committee on Power Plants; Report of Committee on Building and Material of Construction.

7:30 P. M.:—Annual Banquet at Hotel Fowler. Addresses, Toasts and Music. The University Glee Club will render several numbers.

Saturday, January 20th, 9:00 A. M.:—Construction of Bituminous Roads in Lake County, Ray Seeley, Hammond, Indiana; Report of Committee on Streets and Highways; Report of Committee on Sewerage; Sewage Disposal, S. A. Greeley; By-Product Coke Oven, C. C. Abbott; Reports of Committees; Unfinished Business; Installation of Officers; Meeting of next Board of Officers.

Oregon State Association of County Judges and Commissioners.

Delegates to the annual convention of county judges and county commissioners, which was held at Portland, Ore., December 12 and 13, were told how they can obtain \$2,014,000 from the federal government for highway construction during the next five years by Dr. L. I. Hewes, United States district engineer, who will supervise the expenditure of government road money in this district.

John H. Lewis, state highway engineer, urged upon them the necessity of a short, concise and workable road code, in which he was strongly seconded by District Attorney Evans.

J. B. Finch, United States senior highway engineer, explained the operations of the federal method of extending aid for forest reserve roads, and urged co-operation between federal, state and county governments.

O. Laurgaard, chairman of the committee on recodifying state road discussion, recommended that the state laws be recodified, and presented plans for a system of state highways that will call for the expenditure of \$2,000,000 in the next five years.

Governor James Withycombe addressed the convention on "State Highways."

"With state co-operation," said Dr. Hewes, "a total of \$4,028,000 could be raised." In this connection he pointed out that the cost of maintenance of all roads outside of the national forests would fall upon the state or counties, and in some cases maintenance of forest roads would also fall on local taxpayers.

"The act is known as the federal aid road act and is designed for co-operative construction of post roads and for roads and trails within or partly within the national forests, during the next five years.

"For the fiscal year of 1917, \$78,687 is apportioned to Oregon. This will be increased by that amount each year until for the fiscal year of 1921 the allotment becomes \$393,435. In addition there will accrue to Oregon approximately \$127,794 annually for roads in forest reserves, and, moreover, amounts varying from \$25,000 for the present year to \$50,000 for the fiscal year of 1921 from the so-called 10 per cent fund, out of forest revenues.

"The first step to secure federal aid calls for the assent of the state through the legislature, to the provisions of the federal act. Moreover, the state must submit a comprehensive program for a five-year period or as much thereof as is practical."

The problem of Oregon is to get higher efficiency from the \$5,000,000 which is being expended annually on roads of Oregon, according to Mr. Lewis. Of this amount 95 per cent is being spent by the counties and 5 per cent by the state. Owing to lack of centralized authority, conflicting law, absence of construction standards among other things, he declared, has brought on a condition of waste and inefficiency.

As a remedy of the situation, Mr. Lewis declared that a complete, concise and workable road code is necessary.

"We must classify our roads into state, county and district roads and definitely fix responsibility for adminis-

tration of each class," he said. "There should be no overlapping of authority. There must be a head to the system. It should be a single executive officer."

"In order that state and county work may be standardized and put on a business basis, all county engineers should conform to standard rules prescribed by the state highway department. There should be uniform methods of accounting."

"One of the greatest factors to be considered in laying out road systems in the national forests in Oregon is the large area of land they embrace," said B. J. Finch, U. S. senior highway engineer, in discussing "Federal Aid for Forest Reserve Roads."

"Of the 61,188,000 acres of land which comprises the total area of the state, 13,127,000 acres is in national forests, which lie mostly along the Cascade range," he said.

"Naturally this vast area is sparsely settled, and the amount that can be raised by taxation is necessarily small.

In developing a road system for the entire state it is highly necessary that good roads be constructed across these barrier mountains that divide the state.

"One of the main reasons for road construction in national forests is for development of resources. They are also important from the standpoint of the forest service and protection of timber.

"For the fiscal year ending June 30, 1917, there is available for national forest road construction in Oregon approximately \$157,000. On July 1, 1917, there will be available an additional \$160,000, making a total of \$317,000. This with money raised through co-operation from state and county funds will bring the grand total to \$630,000, which can be expended next year.

"In working out our road system it was necessary for the forest service to compile a map of the entire state, showing existing roads and also those necessary to combine these existing roads into a general system.

"In working with the government it will be necessary for the local authorities to match federal funds. It is realized that county aid cannot always be secured and for this reason co-operation from the state is also desirable,

(Continued on page 58.)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

In making a number of PAVING IMPROVEMENTS, the village of New Concord, O., has retained as engineer T. E. Connor, 923 Lindon avenue, Zanesville, O.

Checotah, Okla., is to vote soon on a proposition to improve its WATERWORKS. The engineers on this work are Stevens & Stiles, 222 Commerce Building, Kansas City, Mo.

An additional SEWAGE PUMPING UNIT is to be installed by the city of Detroit, Mich. The plans and specifications were prepared by the consulting engineers, Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Mich.

An election is soon to be called for the purpose of voting on a \$250,000 bond issue for a SEWER SYSTEM for Carnegie, Okla. The Benham Engineering Company, Alcord Building, Oklahoma City, Okla., has been retained to prepare plans.

The village of Williamston, Mich., plans the expenditure of about \$125,000 on a number of improvements, including WATER WORKS, SEWERAGE SYSTEM and PAVEMENTS. The village has retained the L. A. Boulay Company, 1248-1251 Nicholas building, Toledo, O., to prepare plans and estimates for the proposed work.

The councilmen of Columbus, O., are now preparing the 1917 APPROPRIATION ORDINANCE. They have before them in their deliberations the recommendations of the representatives of the New York Bureau of Municipal Research, 261 Broadway, New York, N. Y., who have just completed an administrative survey of all city departments.

An intercepting SANITARY SEWER is to be constructed by the city of Niles, O. The consulting engineer for this project is Alexander Potter, 50 Church street, New York, N. Y.

Upper Darby Pa., and Clifton Heights, Pa., are to construct SEWERAGE SYSTEMS, plans being in preparation by A. F. Damon, Jr., Post Office Building, Darby, Pa.

A SEWAGE DISPOSAL PLANT is to be constructed by Catskill, N. Y. The consulting engineer for this improvement is Henry W. Taylor, 100 State street, Albany, N. Y.

Wyandotte, Mich., is soon to vote on a bond issue for a FILTRATION PLANT, plans and estimates being now in preparation by the engineer, R. Winthrop Pratt, 708 Hippodrome Building, Cleveland, O.

Trenton, N. J., is considering the possibilities of municipalizing the WATER POWER development of the Trenton Water Power Company. Dr. Clyde Lyndon King, of the University of Pennsylvania and the National Utilities Bureau, Philadelphia, Pa., has been in consultation with Mayor Donnelly on this project.

Work on the new Scituate reservoir development for WATER SUPPLY for Providence, R. I., is progressing satisfactorily and the TUNNEL portion is now being planned. Professors Charles W. Brown of Brown University and W. O. Crosby of the Massachusetts Institute of Technology have been appointed as consulting geologists to investigate the earth formation of the site of the tunnel.

PERSONALS

Cole, Charles W., has resigned as city engineer of Mishawaka, Ind., and will become vice-president and general manager of the Midland Co., Construction engineers.

Lumpkin, John F., has been appointed police commissioner of Jefferson City, Mo., succeeding Col. Fred A. Lamb.

Moppert, William, formerly assistant chief, has been elected chief of the Cliffside, N. J., fire department.

Robert James Montague, former mayor of Crookston, Minn., died at Duluth, Minn., on December 21. He was 68 years old and was one of the best known attorneys of the state.

Purcell, Henry, chairman of the Municipal Government League, of Watertown, N. Y., has resigned and attorney John Conboy has been named in his place.

Shuler, E. S., has been appointed city manager of Sumter, S. C.

Wonders, James C., former state highway commissioner of Ohio, has been appointed district engineer under the federal good roads law and will have charge of work in Kansas, Nebraska, Missouri and Iowa.

The following were elected in Halsey (Ore.): Dr. Councilmen, Harry Chance, Frank Gray, Arthur Robnett and G. W. Taylor; recorder, C. P. Stafford; treasurer, B. M. Bond; marshal, James Rector.

The following were elected in Ashland (Ore.): C. B. Lamkin, mayor; G. G. Eubanks, treasurer; John B. Wimer, recorder; J. O. Jarvis, springs commissioner, and G. S. Butler, F. E. Watson, W. B. Holmes for park commissioners.

are located on I beam supports below motor floor. All bearings are lubricated by sight feed oil or automatic compression grease cups.

The Fond du Lac plant was designed by W. S. Shields & Co., engineers, Chicago, Ill., and constructed under the supervision of City Engineer John S. McCullough. The equipment was made by Yeomans Brothers Company, 231 Institute place, Chicago, Ill.

FLUSHING HOSE CART.

Wirt's Equipment for Street Cleaning.

Hand flushing of streets can be made an efficient method of cleaning by the use of specially-designed hose carts and proper nozzles and the employment of properly instructed men. Experienced men, in squads of two, with 100 or 150 feet of hose and a hose cart to enable them to move quickly from hydrant to hydrant, can thoroughly wash the entire surface from curb to curb of up to 40,000 square yards of street in an eight-hour day. The advantages of the method are the inexpensive investment in machinery, the employment of unskilled labor and the low cost of operation if the work is properly organized. The work is done thoroughly—when directed by hand the stream of water can be held on the hard packed dirt as long as necessary to wash it away, and no mud is left on the surface or in the gutters.

The equipment for the work consists of the hose, shut-off nozzle, a hose cart, push broom and sewer pole. Two-inch hose—four-ply duck, with heavy rubber cover to withstand surface wear—is probably best suited for the purpose. The nozzle should be of the shut-off type, with a 3/4-inch outlet. A reducing coupling is used to attach the hose to the hydrant and the coupling should have long lugs so that no spanner is required in connecting and disconnecting.

Wirt's flushing-hose cart is specially constructed for the purpose, and has all the necessary equipment. The design of the cart is the result of a long series of tests made by the Department

of Street Cleaning in New York, which at present has about 150 in use. The wheels are 48 inches high and the length and width of the cart are 79 inches and 35 inches respectively. The capacity of the reel is 200 feet of two-inch four-ply rubber water hose. The equipment includes, besides a tool box, holders for a sewer pole and broom. A device is located below the opening in the drum into which the lugs on the coupling are hooked when starting to wind up the hose and a brake is provided to keep the hose from unwinding itself, and from running off too fast when being laid out for use. The cross brace on the end of the frame at which the hose is wound and unwound is in the form of a roller and chafing is thus eliminated. There are provided a tool box for carrying extra couplings, wrenches, etc., and attachments for holding the broom and sewer pole.

The use of this cart is designed to reduce wear and kinking of the hose so frequent when it is merely folded or heaped on an ordinary cart. The hose is quickly handled and attached and detached and the cart quickly moved about, so that time and energy are saved. The cart itself and an action scene are shown in the accompanying illustrations. The outfit is made by the Wirt & Knox Manufacturing Company, Sedgley avenue, York and 23rd streets, Philadelphia, Pa.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago—Of the awards pending, none is reported as closed among the business of municipal origin, but Cleveland is in the market for 6,000 tons. Quotations: 4-inch, \$44.50; 6-inch and larger, \$41.50; class A, \$1 extra. Birmingham—Pipe makers report a fairly respectable influx of fill-in orders at the advanced prices, but no contracts of any size are offering. The American Cast Iron Pipe Company is receiving hot metal direct from furnaces of the Republic Company to its pits at North Birmingham. Experiments so far are reported satisfactory. Quotations: 4-inch, \$39; 6-inch and up-

ward, \$36; special lengths, \$1 extra. New York—All bids were rejected on 2,500 tons for the city of Boston, opened Dec. 26. The letting has been re-advertised and new bids were opened Jan. 9 on the same specifications. No new municipal business of importance has come out. Inquiries from private buyers are running in somewhat greater volume than usual for the season. Prices are firmly maintained. Quotations: 6-inch, class B and heavier, \$41.50; class A, \$42.50.

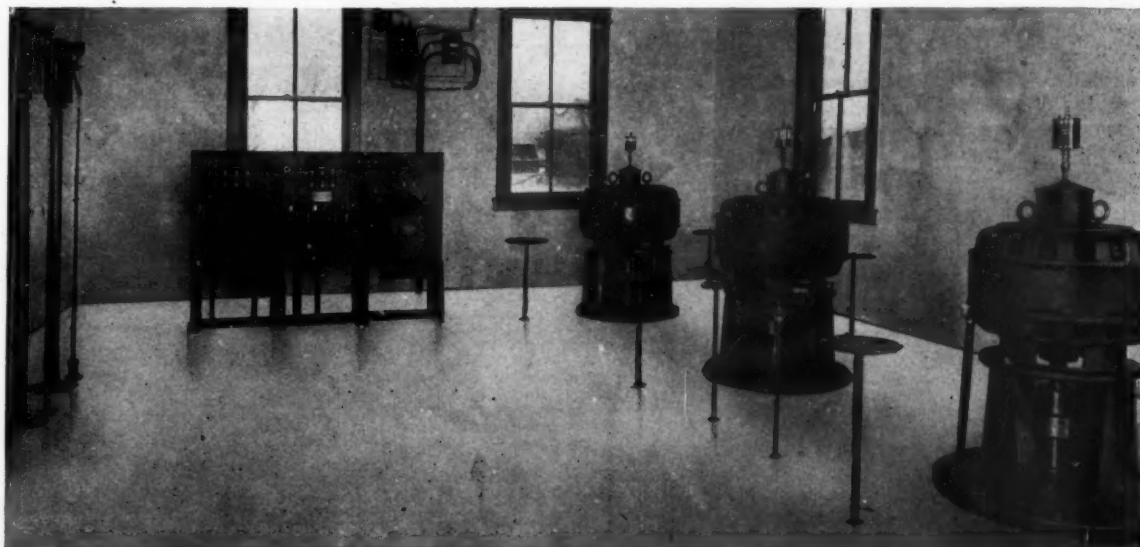
Lead.—Lead is having a quiet, drifting market. Quotations: New York, 7.50 cents; St. Louis, 7.35 cents.

The United States Rubber Company, New York, N. Y., through Samuel P. Colt, president, has pledged a substantial financial contribution to the Lincoln Highway Association for a period of three years. The pledge was made to the national organization through the efforts of F. A. Seiberling, president of the Goodyear Tire & Rubber Company, and a director of the Lincoln Highway Association.

Bidding on Government Contracts in Spain.—The Gaceta de Madrid, official organ of the Spanish Government, under date of November 17, 1916, announces the conditions under which the municipality of Madrid plans to acquire two motor-driven street sweepers and four motor-driven watering carts, the latter not to exceed 28,000 pesetas (\$5,400) each, nor the former 20,000 pesetas (\$3,860).

Under the law of February 14, 1907, as now effective, bids for furnishing this street-cleaning apparatus may be submitted by both Spanish and foreign firms; but among the conditions governing the submission of bids is one requiring that all proposals shall be presented in the Registro General del Ayuntamiento in this city within one month after the publication of these conditions in the Gaceta. It is obvious that even with telegraphic notification American manufacturers desirous of submitting bids for furnishing this apparatus would find it impossible

MOTOR FLOOR
AND
SWITCHBOARD
OF
FOND DU LAC
INSTALLATION.



to submit such bids within the period specified. While in the present instance the value of the apparatus to be purchased is not great, there is no reason for supposing that future and more important purchases of this character will be governed by conditions more favorable to the manufacturer in America. At the present time the municipality of Madrid has under consideration a proposed loan of 146,000,000 pesetas (\$28,178,000), a portion of which, if approved, will be expended for fire, street cleaning, and similar apparatus, this being but one of several important municipal and national projects involving the purchase of large quantities of apparatus and material that might advantageously be imported from the United States.

It seems important, therefore, to bring most seriously to the attention of American manufacturers of automobile trucks and motor-driven street-cleaning and fire apparatus, and to all other American manufacturers interested in obtaining a share in the important Federal and municipal government contracts that may from time to time be open to their bids, the advisability of establishing in Madrid some sort of representation that will enable them to overcome the time and distance handicaps, which, without such representation, are practically prohibitive.

The Goodyear Tire & Rubber Company, Akron, O., through H. S. Quine, secretary to the president, announces that it enters 1917 with unprecedented prospects. "A year ago this time we predicted that in 1916 Goodyear tires would equip one out of three new automobiles turned out of the factories. That prediction came true. For 1917 we are creeping up a little farther. A tabulation of manufacturers' business contracted for shows that we shall equip two out of every five new cars the manufacturers turn out. This means 40 per cent. of an estimated production of 2,000,000 cars—or 800,000 cars that will start rolling on Goodyears. In the cord tire field our position is even stronger. We shall equip three out of every four cars that leave the factory on cord tires in 1917. Goodyear's factory has been practically doubled in less than two years. The new buildings require our taking on approximately 5,000 additional men by the time the season is well into swing

—and our net expectation is that we shall market 50 per cent more product in 1917 than in 1916—and the past year our gross jumped from \$35,000,000 to \$64,000,000."

NEWS OF THE SOCIETIES

(Continued from page 55.)

in order that roads may be completed instead of built piecemeal fashion.

"If state co-operation is to be available, some provision must be made at the coming legislature by which funds for state co-operation on national forest roads will be possible."

He concluded by declaring that roads when built must be maintained and stated that the government would insist upon proper maintenance.

American Society of Civil Engineers.

A meeting, for discussion of the progress report of the special committee on materials for road construction, published in "Proceedings" for December, 1916, will be held at the Society House, 220 West 57th street, at 10 a. m., on Friday, January 19, 1917 (the day following the close of the annual meeting of the society), and, if found desirable, the meeting will be continued in the afternoon.

It is expected that a number of engineers especially interested in road construction will be present and take part in the discussion, and the intention is to afford an opportunity to all who attend the meeting to present their views.

New Jersey Mosquito Extermination Association.

The program for the convention, which is to be held at Atlantic City, N. J., January 25 and 26, is as follows:

First Session—2:00 p. m.—President's address. 2:15 p. m.—"The Circulation of Water on the Drained Salt Marshes; The Need for and the Way to Obtain It," James E. Brooks, M. E., Glen Ridge. 2:40 p. m.—"The General Principles of Salt Marsh Drainage," Harold I. Eaton. 3:05 p. m.—"The Maintenance of Salt Marsh Drainage Systems," William Delaney, Jersey City; John W. Dobbins, Newark; Fred A. Reiley, Atlantic City; Harry G. Van Note, Oakhurst; Stephen Johnson, Manahawkin. 3:55 p. m.—Symposium, "The Status of Mosquito Control Work," by counties. 5:15 p. m.—"The Essential Steps in Upland Mosquito

Control": In both city and country. David Young, Paterson; in a large city, Wilbur Walden, Newark; in the village and open country, W. V. Becker, B. S., Newark.

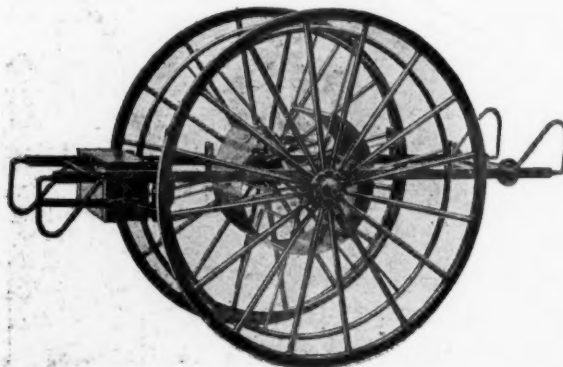
Second Session—Hon. Walter E. Edge, Governor of New Jersey, presiding.—8:00 p. m.—"Mosquito Control in Tropical Countries: Purpose, Methods and Results," W. C. Gorgas, surgeon-general of the U. S. Army. 8:30 p. m.—"The Malaria Problem of the South," H. R. Carter, assistant surgeon-general of the U. S. public health service. 9:05 p. m.—"The Essential Steps in Controlling the Typhoid Fly and Its Associates," L. O. Howard, chief of the bureau of entomology. 9:35 p. m.—"The Agricultural Utilization of the Salt Marsh," Jacob G. Lipman, director of the New Jersey agricultural experiment station.

Third Session—9:00 a. m.—Business meeting. 9:35 a. m.—"The Place of Contract Work in Mosquito Control," Jesse B. Leslie, Hackensack. 10:00 a. m.—"Publicity Methods," Russell W. Gies, Elizabeth. 10:25 a. m.—"The Newer Problems and Methods," Thomas J. Headlee, New Brunswick. 10:50 a. m.—"Mosquito Control Work": In Greater New York, Haven Emerson, commissioner of public health of Greater New York; in Nassau County, C. C. Adams, member of the Nassau County Mosquito Commission; in Connecticut, W. E. Britton, state entomologist of Connecticut; in Virginia, W. A. Schoene, state entomologist of Virginia. 12:00 noon.—"The Meaning of Mosquito Extermination for the People of New Jersey—the Past, the Present and the Future," Ralph E. Hunt, East

Arkansas Good Roads and Drainage Association.

The Arkansas Good Roads and Drainage Association is called to meet at the Auditorium of the Hotel Marion, Little Rock, Arkansas, on Thursday and Friday, January 18 and 19, 1917, by order of the president, J. S. Abercrombie, of Benton, Ark., for the usual annual meeting to transact customary business and hold annual election of officers.

Among the subjects to be discussed are: "Federal Aid for Arkansas Roads," "Arkansas' Road Laws, New and Old and Needful Changes"; "National Highways Through Arkansas" and many other live topics.



WIRT
FLUSHING
HOSE CART
AT WORK.



ADVANCE CONTRACT NEWS

ADVANCE INFORMATION BIDS ASKED FOR

CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
Wash.	Goldendale	Jan. 12	Constructing 5 miles of highway	County auditor
Ky.	Louisville	Jan. 12	Grading Hill St.; cost, \$6,000	Board of Public Works.
O.	Cincinnati	noon, Jan. 13	Constructing 1,600 ft. of gravel road	Albert Reinhardt, Co. Clk.
N. D.	Valley City	2 p.m., Jan. 13	Road construction, involving 101,000 cu. yds. excavation and 6 miles of turnpiking	C. A. Myhre, Co. Surveyor.
Fla.	Kissimmee	Jan. 15	16 miles of brick pavement	A. J. MacDonough, Engr.
Ill.	Oak Park	Jan. 15	Paving with brick and asphaltic concrete	F. W. Sargent, Village Engr.
Tex.	Houston	10 a.m., Jan. 15	Furn. material, paving, grading and improving roads	H. L. Washburn, Co. Aud.
Wash.	Everett	Jan. 15	Hard surfacing two roads	W. C. Bickford, County Engr.
La.	Sheldon	Jan. 15	31,600 sq. yds. of brick, concr. or asph. concr. pav't.	M. V. Norris, City Engr.
Ky.	Paintsville	Jan. 15	Improving and grading streets; cost, \$100,000	City Clerk.
Cal.	Bakersfield	Jan. 15	Grading and paving with asphalt	City Engr.
Ill.	Park Ridge	Jan. 16	5,500 sq. yds. asphaltic concr. pav't, curbs and excav'ts.	Ewing & Allen, Engrs., 111 W. Monroe St., Chicago, Ill.
Okla.	Bristow	Jan. 16	Constructing concrete sidewalks	Ray Powers, City Clerk.
N. J.	W. Orange	8:15 p.m., Jan. 16	Furnishing broken stone and stone dust	Geo. Foster, Town Clerk.
O.	Columbus	2 p.m., Jan. 16	Paving state highways with brick	Clinton Cowen, State Highway Comr.
Ore.	The Dalles	Jan. 16	Grading, bridging, draining and constructing about 23 miles of road; estimated cost, \$260,000	J. A. Elliott, Engr.
Ind.	Indianapolis	10 a.m., Jan. 16	Constructing gravel road	L. K. Fesler, Co. Aud.
Pa.	Wilkes-Barre	noon, Jan. 16	45,000 sq. yds. sheet asphalt, 4,400 sq. yds. brick pavement and 35,000 ft. stone or concrete curb	B. K. Finch, City Engr.
N. Y.	Amsterdam	Jan. 16	35,000 sq. yds. asphalt block pavements	E. H. Prentice, City Engr.
N. Y.	L. I. City	11 a.m., Jan. 17	Furnishing 30,000 asphalt paving blocks; 80,000 gals. of road tar; 30,000 cu. yds. broken trap; 5,000 cu. yds. sand grit or chips; 14,000 cu. yds. of sand; 150,000 gals. asphaltic oil; 80,000 gals. liquid fuel oil; 30,000 wood blocks; 1,500 tons asphaltic cement; 600,000 gals. light road oil; 450 tons dust; 100 tons hydrated lime	M. E. Connolly, Boro. Pres.
Ill.	Springfield	Jan. 17	7,100 ft. bit. macadam resurfacing	State Highway Comr.
N. Y.	Brooklyn	11 a.m., Jan. 17	Constr. curb, lay. sidewalks and pav. with asphalt; furn. 1,000 cu. yds. of gravel	Bur. of Highways, 50 Court St.
Wash.	Auburn	Jan. 17	Constructing two blocks of sidewalks	J. F. Lemar, City Clerk
Cal.	Manhattan Beach	Jan. 17	Constructing concr. pav't, lay. drains, etc.; cost, \$52,000	M. M. Murray, City Engr.
Ala.	Linden	Jan. 18	10 miles sand-clay or gravel roads	A. L. Hosi, Judge of Probate.
Ind.	Auburn	10 a.m., Jan. 18	Constructing gravel road	S. P. Nelson, Co. Aud.
O.	Kent	Mar. 18	17,500 sq. yds. monolithic brick, concrete or asphaltic concrete, curbs, etc.	Fred Bechtie, Village Clerk
N. J.	Keyport	11 a.m., Jan. 19	Warrenite on concrete; cost, \$65,000	J. M. Corlies, Dir. Board of Freeholders.
Ky.	Prestonburg	Jan. 19	Improving several streets; cost, \$50,000	City Engr.
Fla.	Lakeland	1:30 p.m., Jan. 20	138,000 sq. yds. pavement	J. W. Turner, Engr.
Ind.	Connersville	2 p.m., Jan. 20	Constructing concrete roads	Glen Zell, Co. Aud.
Cal.	Upland	7:30 p.m., Jan. 22	Grading and oiling and surfacing	C. P. Fuller, City Clerk.
Ind.	Indianapolis	10 a.m., Jan. 23	Constructing gravel road	L. K. Fesler, Co. Aud.
Ky.	Pikeville	Jan. 24	Co. road work; \$100,000 available	Co. Judge.
Va.	Norton	Jan. 25	Street improvements; cost, \$75,000	City Comrs.
La.	Lake Charles	Jan. 25	12,000 sq. yds. of pavement	City Engr.
Ky.	Salersville	Jan. 26	Co. road work; cost, \$30,000	Co. Comrs.
O.	Ravenna	Jan. 28	1,700 sq. yds. of brick pavement, slag base and stone or concrete curb	S. B. Horsfall, Dir. Pub. Serv.
Ind.	Winchester	10 a.m., Jan. 28	Grading, paving and improving road	C. E. Tilson, Co. Aud.
N. J.	Layton	1 p.m., Jan. 29	Grading with gravel surface	F. W. Tooker, Engr.
Fla.	Gainesville	Jan. 29	Laying 15,000 sq. yds. brick pavement	H. E. Taylor, B. of Pub. Wks.
Ind.	Lebanon	Jan. 29	Thirteen blocks brick pavement, cost \$25,000	Walter Whitecotton, City Eng.
Ky.	Hindman	Jan. 29	Macadam street work; cost, \$40,000	City Engr.
Ind.	Evansville	10 a.m., Jan. 29	Constructing county roads	C. P. Beard, Co. Aud.
Ky.	Ravenna	Jan. 31	Street improvement; \$25,000 available	City Clerk.
Fla.	Jacksonville	4 p.m., Jan. 31	2,575 square yards asphaltic, concrete pavement and 254 square yards vitrified block gutter	Comr. of Public Works, Highway Department, Main and Orange Sts.
O.	Springfield	noon, Jan. 31	Paving streets, 9 jobs; cost, \$115,000	C. E. Ashburner, City Mgr.
O.	Urbana	Feb. 1	Paving West Jefferson Rd.	W. S. Coffey, Co. Aud.
La.	Cedar Rapids	Feb. 1	Paving thirteen blocks; cost, \$90,000	T. F. McCauley, Engr.
Ill.	Cicero	Feb. 1	8,290 sq. yds. asphaltic concrete pavement, and 5,800 feet concrete curb	Lewis Mangreig, Engr.
Va.	Appalachia	Feb. 1	Street improvement; \$80,000 available	City Comrs.
Tex.	Mt. Vernon	noon, Feb. 1	Constructing highway system complete	Judge Reeves, Co. Judge.
Ind.	Jeffersonville	10 a.m., Feb. 5	Constructing macadam road	G. W. Stoner, Co. Aud.
Ind.	Brownstown	1 p.m., Feb. 5	Three concr. roads, one tarvia mac. and one gravel	Albert Luedtke, Co. Aud.
Minn.	Montevideo	Feb. 5	17,537 sq. yds. of wood block pavement and 660 sq. yds. concrete or bitulithic pavement	B. O. Bonn, City Clerk.
Ind.	Kokomo	10 a.m., Feb. 6	Constructing gravel and stone roads	W. L. Benson, Co. Aud.
Ind.	Crawfordsville	10 a.m., Feb. 6	Gravel and limestone roads	Dr. W. F. Batman, Co. Aud.
Ind.	Rochester	2 p.m., Feb. 6	Constructing stone roads	E. A. Smith, Co. Aud.
Ind.	Corydon	2 p.m., Feb. 6	Constructing macadam roads	Sam C. Mauck, Co. Aud.
Ind.	Brazil	10:30 a.m., Feb. 6	Constructing two stone and gravel roads	W. O. Graeser, Co. Aud.

BIDS ASKED FOR

STATE	CITY	RECD UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
N. J.	Neshanic	Feb. 6..	12,000 sq. yds. macadam pavement	C. Van Cleef, Clerk, Twp. Committee.
Ky.	Irvine	Feb. 12..	1.5 mile state aid road construction	J. A. Alexander, Co. Clerk.
Ill.	Virginia	April 1..	Road improvement; cost, \$14,000	Co. Clerk.
SEWERAGE.				
N. Y.	New York	10:30 a.m., Jan. 12..	Sewage pumping plant at Health Dept. grounds near Jamaica	Board of Health, Center and Walker Sts.
Mich.	Flint	Jan. 12..	Furnishing catch basins, manhole and crosswalk castings, sewer pipe and Portland cement	D. E. Newcombe, City Clerk.
Okla.	Muskogee	Jan. 12..	Constructing sanitary sewer	H. L. Fist, City Clerk.
Ky.	Louisville	Jan. 12..	900 feet sewer, 66 to 84 inches, reinforced concrete	Roy Burks, City Engr.
Mich.	Flint	8 p.m., Jan. 12..	Tile and reinforced concrete storm and sanitary sewers, about 25 miles, 8 to 66 inches	E. C. Shoecraft, City Engr.
Minn.	Blue Earth	10 a.m., Jan. 12..	Tile drainage ditch; cost, \$58,000	J. L. Herring, Co. Aud.
Minn.	Blue Earth	11 a.m., Jan. 12..	Tile drainage ditch; cost, \$70,000	J. L. Herring, Co. Aud.
Minn.	Blue Earth	1 p.m., Jan. 12..	Tile drainage ditch; cost, \$65,000	J. L. Herring, Co. Aud.
Minn.	Blue Earth	1:30 p.m., Jan. 12..	Tile drainage ditch; cost, \$27,000	J. L. Herring, Co. Aud.
Minn.	Worthington	11 a.m., Jan. 13..	Constructing drainage ditch No. 3, requiring 6 to 22-in. tile; estimated cost, \$13,750	Gus Swanberg, Co. Aud.
Minn.	Worthington	11 a.m., Jan. 13..	Constructing drainage ditch No. 4; est. cost, \$23,000	Gus Swanberg, Co. Aud.
S. D.	Canton	10 a.m., Jan. 15..	Constructing drainage ditch No. 17	G. A. Lomen, Co. Aud.
Okla.	New Cordell	Jan. 15..	Constructing sewerage sys. and sewerage dis. plant	Benham Engrs. Co., Colcord Bldg., Okla. City, Okla.
Ind.	Dunkirk	8 p.m., Jan. 15..	Constructing sewer	L. A. Pratt, City Clerk.
Ont.	Smiths Falls	noon, Jan. 15..	2,700 ft. sewer and water mains	S. B. Code, Town Engr.
N. Y.	New Brighton	noon, Jan. 15..	Constructing temporary sanitary sewer	Engr., Bureau of Engineering.
N. J.	Camden	8 p.m., Jan. 15..	Constructing brick sewers and drains	L. E. Farnum, City Engr.
N. Y.	Niagara Falls	Jan. 15..	Constructing sewers; estimated cost, \$340,000	W. B. Bennett, Engr., Convention Hall.
Ia.	Lennox	Jan. 15..	5,360 ft. 8 and 10-in. vitrified sewer and one septic tank	R. H. Hammen, Engr., Creston, Iowa.
Mo.	Albany	Jan. 15..	Constructing sewer system and disposal plant	E. T. Archer & Co., Engrs. New England Bldg., Kansas City, Mo.
Ill.	Berwyn	Jan. 15..	Sewer construction; cost, \$20,000	B. Strutzenberg, City Engr.
Ill.	Alton	2 p.m., Jan. 15..	Constructing trunk sewer	P. H. Landon, City Engr.
Mich.	Detroit	10 a.m., Jan. 15..	Furn. vit. sewer crock and specials; also sewer grates	G. H. Fenkell, Comr. of P. W.
N. Y.	Auburn	8 p.m., Jan. 16..	Constructing storm water sewers	T. B. Bergan, City Engr.
Ill.	Park Ridge	Jan. 16..	Constructing sewers and water mains	Ewing & Allen, Engrs., 111 W. Monroe St., Chicago, Ill.
Ind.	Lafayette	Jan. 17..	8.5 miles 8 to 12-in. sewer, cost \$55,000	H. B. Overesch, Jr., City Engr.
N. Y.	Brooklyn	11 a.m., Jan. 17..	Constr. sewers in sev. streets; est., about \$200,000	Bur. of Sewers, 215 Montague St., Brooklyn.
N. Y.	Brooklyn	11 a.m., Jan. 18..	Furnishing manhole heads and covers	L. H. Pounds, Boro Pres.
Iowa	Muscatine	7:30 p.m., Jan. 18..	Constructing sewers	C. H. Young, Engr., City Hall.
O.	Alliance	noon, Jan. 18..	Improving sewage treatment plant and laying sewers	R. Winthrop Pratt, Engr., Hippodrome Bldg., Cleveland, O.
N. J.	Millville	3:30 p.m., Jan. 19..	Constructing sewage pumping station and extending sewer system	Newton B. Wade, City Engr.
O.	Akron	noon, Jan. 19..	Grading and constructing sewers	C. F. Beck, Dir. Pub. Service.
Minn.	Gaylord	1 p.m., Jan. 20..	Constructing tile drains, cost \$7,000	Fred Hoppenstedt, Co. Aud.
O.	Amherst	Jan. 23..	Constructing sanitary sewers; cost, \$8,000	A. G. Menz, City Clerk.
Ia.	Dows	2 p.m., Jan. 23..	Sewer system, requiring 50,000 ft. 6 to 15-in. sewer and one septic tank	M. Tschirgl & Sons, Engrs., Amer. Trust Bldg., Cedar Rapids, Ia.
Ind.	LaFayette	Jan. 24..	8 1/2 miles 8 to 12-inch sewer	E. J. Vaughan, Clerk.
Minn.	Crookston	10 a.m., Jan. 25..	Constructing drainage ditches, cost \$8,000	H. J. Welte, Co. Aud.
Mich.	Detroit	10 a.m., Jan. 26..	Constructing sewage pumping unit	G. H. Fenkell, Comr. Pub. W.
O.	Springfield	noon, Jan. 31..	Constructing 4 sewer jobs; cost, \$37,564	C. E. Ashburner, City Mgr.
Ill.	Cicero	Feb. 1..	1,033 feet of sewers, cost \$2,100	Lewis Mongreig, Engr.
Ia.	Rockwell City	Feb. 5..	Disposal plant; \$10,000 available	F. E. Burnham, City Engr.
Wis.	Chilton	Mar. 6..	Constructing sewer system, cost \$22,000	Jerry Donohue, Engr., Sheboygan, Wis.
Ind.	Shelbyville	March 6..	Constructing sewer	City Engr.
India	Calcutta	2 p.m., June 1..	Storm water pumping plant	C. C. Chatterjee, Sec. Corp. of Calcutta.
WATER SUPPLY.				
Ariz.	Yuma	Jan. 12..	Constructing intake 745 ft. long and 60 ft. wide on Colorado River; cost, \$200,000	Imperial Irrigation District, El Centro, Cal.
Minn.	Plainview	7:30 p.m., Jan. 12..	Wrecking old tank and constructing 60,000-gal. wood tank on 80-ft. tower	J. F. Druar, Engr., Commercial Bldg., St. Paul.
Tenn.	Knoxville	Jan. 15..	Furnishing 1,000 to 5,000 water meters	City Commissioners.
Ont.	Smiths Falls	noon, Jan. 15..	Constr. of water and sewer mains, 2,700 ft.	S. B. Code, Town Engr.
Pa.	Reading	Jan. 15..	Laying about 4 miles of 12-inch water pipe	S. W. Cooper, Engr., Millersburg, Pa.
O.	Geneva	Jan. 15..	Sedimentation tank and filter plant; cost, \$6,000	J. Reeves, Supt. Gen. Water Co.
Ont.	Toronto	noon, Jan. 16..	Constructing 12-in. mains	Dept. of Works, City Hall.
Ill.	Park Ridge	Jan. 16..	Constructing water mains and sewers	Ewing & Allen, Engrs., 111 W. Monroe St., Chicago, Ill.
N. Y.	L. I. City	11 a.m., Jan. 17..	Furn. 1,080 ft. 12-in. c. i. pipe	M. E. Connolly, Boro Clerk.
Ia.	Walnut	2 p.m., Jan. 18..	Drilling artesian well	C. P. Chase, Engr., Clinton, Ia.
N. J.	Atlantic City	Jan. 18..	114 high pressure fire hydrants	L. Van Gilder, City Engr.
D. C.	Washington	2 p.m., Jan. 21..	Filtering and sterilizing system	Chief Clerk, Engr. Dept., District Bldg.
Mich.	Detroit	2 p.m., Jan. 22..	Furnishing 16,000 feet 4 and 6-inch c. i. pipe, 21 hydrants and 42 valves	R. A. Murdoch, Engr., 706 Free Press Bldg.
Tex.	Brownsville	Feb. 1..	One 6-in. and two 8-in. centrifugal pumps, direct connected to motors	F. H. Williams, City Mgr.
Cal.	Coalinga	Feb. 1..	Constructing water system, cost \$100,000	F. G. Dessery, Engr., Central Building.
Minn.	St. Paul	10:30 a.m., Feb. 5..	Furnishing material for construction reservoir	Engr., Bd. of Water Comrs.
Ill.	Springfield	Mar. 1..	3.5 miles 24-inch water main extension; cost, \$90,000	City Engineer.
Wis.	Chilton	Mar. 6..	Constructing water works system, cost \$45,000	Jerry Donohue, Engr., Sheboygan, Wis.
O.	Mt. Vernon	April 1..	Installing meters; \$20,000 available	C. G. Snow, Dir. of Pub. Serv.
Ill.	Gibson City	April 1..	Constructing water and light plant	City Clerk.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
MISCELLANEOUS.				
Alaska,	Ketchikan	Jan. 12.	Furnishing sheet lead, iron bars, etc.	W. C. Dibree, Lighthouse Inspector
Wash.,	Seattle	10 a.m., Jan. 12.	Constructing comfort station	City Architect, Co.-City Bldg.
N. Y.,	New York	noon, Jan. 12.	Dredging in the East River	R. A. C. Smith, Comr. of D'ks.
N. Y.,	New York	10:30 a.m., Jan. 12.	Furnishing metals and wire for Fire Dept.	Robt. Adamson, Fire Comr.
Cal.,	Berkeley	10 a.m., Jan. 12.	Furnishing two 1-ton motor trucks	A. G. Briggs, City Clerk.
O.,	Columbus	noon, Jan. 15.	Sale of garbage tankage and grease	G. A. Borden, Pres., Board of Purchase.
Ind.,	Williamsport	2 p.m., Jan. 15.	Constructing drainage ditch	J. Rupert Gregory, Drainage Commissioner.
Tenn.,	Memphis	Jan. 15.	Furnishing 25,000 tons riprap stone	U. S. Engr. Office, Cus. House.
Mich.,	Detroit	10 a.m., Jan. 15.	75,000 bbls. Portland cement	G. H. Fenkell, Comr. Pub. W.
La.,	New Orleans	Jan. 16.	Constructing bulkhead at Southwest Pass, Mississippi River	U. S. Engr. Office, Custom House
Minn.,	Walker	Jan. 16.	Constructing drainage ditches; cost, \$5,000	C. D. Bacon, Co. Aud.
N. Y.,	Brooklyn	11 a.m., Jan. 17.	675 tons quicklime at disposal plant	L. H. Pounds, Boro Pres.
N. Y.,	L. I. City	11 a.m., Jan. 17.	270 tons of quicklime	M. E. Connolly, Boro Pres.
O.,	Cheviot	noon, Jan. 17.	Collecting garbage and ashes during 1917	A. J. Reusing, Village Clerk.
N. Y.,	Albany	noon, Jan. 17.	Constr. temporary terminal warehouses at several points along canal	W. W. Wotherspoon, St. Supt. of Public Works.
Minn.,	Henderson	Jan. 17.	Constructing two drainage ditches	F. Hoppenstedt, Co. Aud.
Ia.,	Glenwood	1 p.m., Jan. 18.	Constr. drainage ditch, involving 400,000 cu. yds. excav.	Seth Dean, Engr.
Wash.,	Wenatchee	Jan. 19.	Constructing U. S. post-office	Supervising Architect, Treasury Dept., Wash., D. C.
Utah,	Richfield	3 p.m., Jan. 22.	Constructing U. S. post-office	Supervising Architect, Treasury Dept., Wash., D. C.
Tex.,	Houston	noon, Jan. 22.	Constructing warehouse at Turning Basin	E. E. Sands, City Engr.
Tex.,	Rockwell City	1 p.m., Jan. 23.	Constructing drainage ditches	R. B. Dixon, Co. Aud.
Minn.,	Crookston	10 a.m., Jan. 25.	Constructing drainage ditch, cost \$6,000	H. J. Welte, Co. Auditor
Pa.,	Philadelphia	Jan. 29.	Constructing concrete dry dock at navy yard	Bureau of Yards and Docks, Navy Dept., Washington
D. C.,	Washington	Jan. 30.	Furnishing reinforcing material	Supt. of Prisons, Dept. of Jus.
South Africa,	Johannesburg	Feb. 15.	Machinery for utilizing by-products at municipal abattoirs	Municipal Council.
La.,	Alexandria	8 p.m., March 7.	Levee constr., requiring 2,000,000 cu. yds. excav.	Bd. of State Engrs., New Orleans Court Bldg., New Orleans.

STREETS AND ROADS

Oracle, Ariz.—From Oracle to Brady Ranch, board supervisors Penal county plans 11 mile road. County clk. Florence.

Fresno, Cal.—Resolution for improvement of Mono St. from the northeasterly line of Van Ness Ave. to the southwesterly line of Santa Fe Ave., to be graded, curbed and guttered with cement concrete curb and gutter and paved with a pavement consisting of a 5-in. cement concrete base and a 2-in. bitulithic wearing surface, and culverted with corrugated iron culverts.

Los Angeles, Cal.—Ordinance of intention adopted for the improvement of Mohawk St. from Effie St. to Berkeley Ave.; establishing curb lines on Washington St. from 5th Ave. to West City boundary line; establishing the grade of Orange Drive St. from Sunset Blvd. to De Long Pre Ave.

Los Angeles, Cal.—Ordinance of intention adopted for the improvement of Bronson Ave. from Wilshire Blvd. to Country Club Drive.

Oakland, Cal.—The Board of Supervisors appropriated \$60,000 toward paving a strip 17 ft. wide along the west side of San Pablo Ave. for a distance of 3.5 miles through Berkeley and Albany to the county line. The cities will share the cost.

Hartford, Conn.—City plan commission approved the Morgan St. extension project, which contemplates creating a new street, opposite Morgan St. and extending from Main St. to Trumbull St. and voted to submit to with layout and recommendation to the common council.

Stamford, Conn.—See "Sewerage."

Tarpon Springs, Fla.—To vote on \$7,500 bonds to improve streets and parkways, election Jan. 22. E. F. Albaugh, city clerk.

Denver, Colo.—Bosworth, Chanute & Co. and the International Trust Co. of this city have jointly purchased \$150,000 road bonds recently issued by Navarro county, Texas. The bonds were awarded to the Denver firms after the keenest competition with numerous bond houses of Chicago, St. Louis and other cities. Bonds were bought on a 4.8 per cent. basis. They are issued for the purpose of constructing highways through Navarro county to connect with the good roads system now being built to cover the state of Texas. The bonds were voted by District No. 9, which embraces 20 per cent. of Navarro county. Corsicana, the county seat, is situated 50 miles south of Dallas.

Fellsmere, Fla.—\$50,000 bond issue for

street improvements was carried. The town commissioners will immediately advertise for the construction of improvements and the sale of bonds.

Jacksonville, Fla.—Streets to be paved will be listed soon by committee on public works.

Macedenny, Fla.—Election for road bonds to the amount of \$75,000 carried.

St. Augustine, Fla.—City commissioners passed an ordinance for opening of Hedrick St.

Columbus, Ga.—Ordinance adopted for the grading and curbing of 11th St. from between Seventh and Eighth Aves to 10th Ave.; 10th St. to 10th Ave.; 10th Ave. from 10th to 11th Sts., and 23d St. from Hamilton Ave. west to Robinson St. Also for the widening of 12th Ave., between 15th and 16th.

Council, Ida.—Count commissioners are considering the question of issuing road improvement bonds to the amount of \$80,000.

Grangeville, Ida.—The Idaho County Good Roads Association went on record emphatically in support of the north and south state highway and passed a resolution favoring submission by the commissioners to the voters of a bond issue in the sum of \$500,000.

Weiser, Ida.—Sealed bids Jan. 13, road and bridge bonds; \$100,000. Clerk Co. Comrs., Frank E. Smith.

Dixon, Ill.—Lee county plans improving portion Lincoln highway. L. B. Neighbour, Dixon, County Engr.

Joliet, Ill.—The first resolution and estimate for the paving of Dover St. from Youngs Ave. to the east city limits was presented, \$2,001.49. An asphaltic concrete pavement will be laid on a natural foundation. Public hearing was set for Jan. 15.

Princeton, Ill.—Bids received in March for paving; also concrete gutters. Board Local Improvements.

Rockford, Ill.—The Bd. of Supervisors is contemplating the issuance of road bonds to the amount of \$1,500,000.

Springfield, Ill.—Paving six streets considered by city. W. D. Seeley, City Engr.

Waukegan, Ill.—For about \$218,000, Lake county made plans for roads. E. E. Russell, Waukegan, County Supt.

Boonville, Ind.—Bids received Jan. 25, 1917, at 10 a. m., by treasurer of Warrick county, for sale \$11,521, \$11,179 and \$5,300 highway improvement bonds, 4½ per cent., ten years. James Allen, Treasurer.

Columbia, Ind.—Bids received Jan. 20, 1917, at 1 p. m., by treasurer of Whitley county, for sale \$4,507.80, \$5,366, \$12,820,

\$9,000, \$8,140 and \$12,156 highway improvement bonds, 4½ per cent.

Crown Point, Ind.—Bids received Jan. 15, 1917, at 10 a. m., by treasurer of Lake county, for sale \$18,000 and \$20,000 highway improvement bonds, 4½ per cent., ten years. M. J. Brown, Treasurer.

Evansville, Ind.—Mayor Benjamin Boose's annual message to council recommends that special efforts should be made to pave the following streets: West Pennsylvania St., West Franklin St. from St. Joseph Ave. to Barker Ave.; 11th Ave. from Ohio St. to Maryland St.; Franklin St. from Fulton Ave. to First Ave.; Fulton Ave. from Mogan Ave. to Blankenburg School; Elliott St., including the portion opened during the year from Lincoln Ave. to Canal.

Gary, Ind.—Bids received Jan. 18, 1917, at 12 m., by city controller, for sale \$60,000 park bonds, 4½ per cent., 20 years. Geo. Manlove, City Controller.

Goshen, Ind.—The Salem Bank of Goshen, Ind., was the successful bidder for a \$1,000 issue, Elkhart county highway bonds, paying a premium of \$25.50. These are 10-year 4½ per cent. bonds.

Greencastle, Ind.—Bids received Feb. 5, 1917, at 1 p. m., by treasurer of Putnam county, for sale \$7,400 and \$3,100 highway improvement bonds, 4½ per cent., 10 years. H. H. Runyan, Treasurer.

Logansport, Ind.—Bids received Jan. 15, 1917, at 10 a. m., by treasurer of Cass county, for sale \$8,000 and \$15,000 highway improvement bonds, 4½ per cent., 10 years. U. S. Hoffman, Treasurer.

Mishawaka, Ind.—Board of public works, a resolution was adopted to open Forest Ave. across the Grand Trunk tracks.

Monticello, Ind.—Bids received Feb. 3, 1917, at 10 a. m., by treasurer of White county, for sale \$7,500 highway improvement bonds, 4½ per cent., 19 years. O. C. Middlestadt, Treasurer.

New Albany, Ind.—Claude A. Sittason, county treasurer, sold two issues of county highway 4 per cent. bonds, aggregating \$16,840, for an aggregate premium of \$299. Of the bond issues, one was for \$7,840 to cover the cost of the construction of the Graybrook road in New Albany township, \$9,360 to cover the cost of the Ford road in the same township. The New Albany Trust Co. was the purchaser of both issues, paying for the Graybrook road bonds a premium of \$166. Bidders were Mutual Trust & Deposit Co. of New Albany, Graybrook road bonds, \$78.50; Ford road bonds, \$94. State Savings & Trust Co., Indianapolis, Graybrook road bonds, \$50; Ford road bonds, \$70. J. F. Wild & Co., Indianapolis, Graybrook road bonds, \$90.35; Ford road bonds, \$109.80.

Rushville, Ind.—Bids received Jan. 16, 1917, at 2 p. m., by treasurer of Rush county, for sale \$9,000 highway improvement bonds, 4 per cent., 10 years. John O. Williams, Treasurer.

Terre Haute, Ind.—Bids soon received improving portion 3d and S. 8th Sts. and Wabash Ave., asphalt and brick. Board of Public Works. F. Kattman, city engr.

Cedar Rapids, Ia.—Paving resolution will be presented for the following streets and avenues: First Ave. from First to 10th St., and from 13th to 15th St.; First St. from B Ave. to Fifth Ave.; Sixth St. from A Ave. to Third Ave.; Fourth Ave. from First to Second St.; Bever Ave. from 21st St. to the city limits; Second St. from First to A Ave.; Third St. from First to A Ave.

Hampton, Ia.—Resolution by the city council for the construction of paving during 1917. Objections will be heard Jan. 26. Consists of about 90,000 sq. yds. of paving and 90,000 lin. ft. of curbing or combined curb and gutter. The above amounts will probably be somewhat reduced before final advertisement for bids. Theo. S. Delay, Consulting Engineer.

Waterloo, Ia.—Lincoln St. is to be opened from Dawson to Riehl St. across the Illinois Central right-of-way.

Dodge City, Kan.—T. J. Schall, Dodge City, Highway Engr., Ford county, plans paving north end of Minneola-Dodge City road.

Earlington, Ky.—Bids received by city April or March to improve streets. W. E. Rash.

Louisville, Ky.—Improving portion Western Parkway, considered by board park commissioners. D. R. Lydam, city engr.

Kinder, La.—To vote on \$750,000 bonds for roads and bridges, Road Dist. No. 2, Allen county, plans an election. C. Lindsay, Oberlin, Secy. Police Jury.

Newtown, L. I.—Petitions for regulating, grading, curbing and laying sidewalks in Kingsland Ave. from Luydig place (Irving place) to 51st St. (Central Ave.); for regulating and grading the sidewalk and gutter space and laying Sidewalk and gutters from Harold Ave. to Gosman Ave.; for grading the gutter space from Hill St. to Harold Ave., and for setting curb from Hill St. to Gosman Ave., on the southerly side of Queens Blvd.; for the construction of a receiving basin and appurtenances on the northeast corner of Sedgwick St. and Catalpa Ave.; for regulating and grading the sidewalk and gutter spaces and laying sidewalks on the west side of Farrington St. from State St. to Elbow place; for laying sidewalks in Eighth St. from Vernon Ave. to Jackson Ave.; for regulating, grading, curbing and laying sidewalks in 76th St. from Atlantic Ave. to North Conduit Ave.; for regulating and paving in Hughes St. from Sedgwick St. to Fremont St.

Annapolis, Md.—Jan. 25 State Treas. John M. Dennis will receive bids for road bonds; \$600,000.

Baltimore, Md.—Mayor Preston has ambitious plans for the paving of Baltimore during coming year. One of the things which is proposed is the paving of all alleys south of North Ave. before Aug. 1. This in itself is a big accomplishment for a few months, but, in addition, the paving commission has already selected a great number of streets in all sections of the city for improvement. Most of these streets will be connecting links with streets already improved, but there are some very big contracts to be awarded. Pennsylvania Ave. from North Ave. to Franklin St. another big project.

Ocean City, Md.—Seven mile concrete road and sidewalks contemplated by Isle of Wright Land Co.

Attleboro, Mass.—Mayor Sweet in his annual message to council recommends Union St. to be paved and paid for inside five years. Wants start made on system of draining surface water.

Beverly, Mass.—Mayor James McPherson, in his annual message to council, recommends that a committee be appointed at once to investigate the advisability and the cost of extending River St. to Elliot. The extension of Odell Ave. to Cabot St. Immediate attention be given for construction of a sewer on Bridge St., motorizing the fire department and that one or more gasoline pumping engines be installed, and comfort station in the heart of the city.

Fitchburg, Mass.—Mayor Foss recommends in his annual message to City Council immediate action for further widening of Elm St. near Prichard St., and advocates that the River Circle St. end of proposed Broad St. be laid out.

Fitchburg, Mass.—The city council has approved orders authorizing the issuance of the following bonds: Street, sidewalk, bridge and sewer, \$90,000; water supply, \$75,000; playground, \$1,600.

Leominster, Mass.—Mayor Sawtelle recommends in his message to council for street and highway department that additional machinery be purchased this year and that a reasonable amount of so-called permanent rock road with bituminous binder be constructed. Present tarvia and asphalt construction should be properly maintained, and our other highways should have the necessary attention.

Battle Creek, Mich.—Action will be taken on the recommendations of the county road commission, the report providing for the construction of 3 miles of road in each township this summer and spending \$370,000 of the good roads money.

Battle Creek, Mich.—Board of Supervisors decided to sell the entire issue of \$800,000 in good roads bonds and place the money in banks in Calhoun county. Feb. 8 to open bids on the bonds.

Detroit, Mich.—Committee on Streets ordered the opening of Maxwell Ave. from Harper to Auburn Ave.; Pressler Ave., from Maxwell to Van Dyke, and Curt Ave., from Maxwell to Van Dyke.

Detroit, Mich.—The widening of Warren Ave. from Epworth Blvd. to the westerly city limits was ordered.

Jackson, Miss.—A resolution declaring a sidewalk necessary on the east side of Magnolia St. from Capitol St. to Second Ave.

Leakesville, Miss.—\$100,000 bonds to build roads, board of supervisors, Green county. Address County Clerk, Leakesville.

Joplin, Mo.—The council adopted an ordinance to macadamize Sixth St. from Virginia Ave. to Kentucky Ave.

Palmyra, Mo.—Between city limits and pump-house on Bay Island, Marion county plans improving river road, about \$4,000.

Stikeston, Mo.—Street and sewer bonds, \$15,000; Messrs. Alden H. Little & Co., of St. Louis, successful bidder. Earl J. Malone, Mayor.

Camden, N. J.—Mayor in his annual message recommends recently acquired meadow land on Broadway could be converted into an ideal playground in the summer, in the winter as a skating center, under municipal auspices; recommends playground commission be provided with sufficient funds to carry out these suggestions; also suggests improvements to parks; an appropriation to the street department sufficient to permit doubling the capacity of the asphalt plant. East Camden advocates a bond issue sufficient to improve the principal streets and the improvement of all highways entering the city that connect with all main state and county roads.

Camden, N. J.—Ordinance directing the paving of Pavonia St. from Kaighn Ave. to Mechanic St., with 8-in. concrete pavement.

Collingswood, N. J.—Mayor Thos. W. Jack in his annual message urges a concentrated effort of citizens and public officials for the proposed \$150,000 bond issue for improved street charged the town in general with responsibility for the success of improvements.

East Rutherford, N. J.—Mayor Weaver announced in his message that the Street Committee have under consideration the repairing and improving of Park Ave.

Garfield, N. J.—Mayor Ernest B. Dahnert in his annual message recommends that the Freeholders of Passaic and Bergen Counties make an effort to have a sidewalk built on the Outwater Lane Bridge which connects the upper part of the borough with Clifton.

Rutherford, N. J.—Mayor Black recommends in his message to Council the necessary improvements on Union Ave.

Trenton, N. J.—City board of assessors relative to the paving of 14 city streets, the work of making levies incident to the improvement will now be started.

Wood Ridge, N. J.—Mayor Gramlich in his message to Council recommends: Sidewalk on Wood Ridge Ave.; curb and gutter and sidewalk on Columbia Blvd.; curb and gutter on Valley Blvd.; the matter of taking over Valley Blvd. and necessary improvements connected with it; Wood Ridge Ave. west of trolley should be macadamized, providing the property owners west of 7th St. will curb and gutter and prepare for it; Columbia Blvd. will need macadam in the near future; sidewalk on Hackensack St. Asked every effort be given toward

applying a remedy for collection of garbage.

Amsterdam, N. Y.—Mayor Cine, in his annual message, recommends the allowance of \$30,000 for paving under city charter be spent in repaving East Main St. from Market St. to Hamilton St., work to commence as soon as wires are placed underground; Cherry St. should also be paved. For the coming year recommends that all the water bound macadam subjected to much traffic be surfaced with bitumen and that no new macadam be laid except it be bituminous; also recommends a motor aerial hook and ladder truck, repairs to fire house No. 2, or new building.

Auburn, N. Y.—Mayor Mark I. Koon's message to the council recommends immediate action toward construction of two new bridges in State St. and in North Division St., the latter to be constructed on a pay-as-you-go policy; a reduction in the cost of maintaining streets by construction of more pavements; the purchase of a motor flushing apparatus for paved streets and doing away with open iron gratings in the sidewalks in the business section and substitution of movable glass grates.

Auburn, N. Y.—City Engineer Thomas B. Bergan, in his annual report, advocates the use of stone filled asphalt in all paving in future.

Aurora, N. Y.—State highway construction in Tompkins county, north of Ithaca, through Ludlowville to connect with the state road south of Auburn to King Ferry, is urged by State Commissioner of Highways Edwin S. Duffy, who spoke at length upon the subject of Tompkins county and other roads before the Board of Supervisors. In addition to the construction of a road north of Ithaca to connect that city with Auburn, the commissioner also urged the completion of a road south of Ithaca, connecting Owego and the College City. With these two roads constructed and other stretches built, a trunk line from north to south across the state through Auburn will be completed; also urged the necessity of constructing a road between Hartford and Dryden. This would make a complete connecting link between Owego and Ithaca.

Cohoes, N. Y.—Mayor James S. Calkins recommends in his annual message that the ornamental lighting system on Remsen St. be extended south to Columbia St. and on Ontario St. west to the Cohoes Co.'s canal, lights be placed in front of the city hall, North Mohawk St., White St., Simmons Ave. and South Saratoga St. be paved and part of the roadway of Vliet St., from Garner St. to the New York Central Railroad, be repaired. Asks that the council investigate the advisability of paving Park Ave.

Rome, N. Y.—Improvement by paving has been asked of the Board of Public Works for the following streets: South George from Ridge to Matthew Sts.; Depyster from Bouck to Lawrence; Canal from South James to the Merchant Iron Mill; Steppen from Park to Stanwix; Spring from East Liberty to Stanwix; East Embargo from James to the Black River Canal; Court from Wood Creek to Expense; North George from Locust to Sycamore; Brush Ave. from Court to Thomas. On the latter street, Com. Lawton said that he would like to have a concrete pavement used.

Rome, N. Y.—Mayor H. C. Midlam, in his message to Council, recommends widening of East Dominick St. Should be completed early in the spring. The south side of the street will be widened 10 ft. from James St. to Spring St., and the north side will start on a line about 10 ft. inside the present curb and extend on a slanting line about 200 ft. east back to the present curb.

Utica, N. Y.—Commissioner of Public Works Harry R. Hayes, in his annual report to Common Council, recommends that the city should assume more of the cost of resurfacing streets that such work may be done before the pavement is entirely worn out; that a definite sewer system should be established; a motor truck be purchased for his department. Also the condition of the Broad St. pavement, Washington St. between Lafayette St. and the Erie Canal, and the Main St. pavement is such as to warrant some permanent repairs.

Utica, N. Y.—The following proposed ordinances were referred to the proper standing committees: Determining to pave (resurface) Howard Ave. from Rutter St. to South St., and Church lane from Devereux St. to Blandina St.; pave Hagar St. from Newell St. to the Park-

way; Watson Place from Sunset Ave. to Lincoln Ave.; Hart St. from Mandeville St. to Kirkland St.; Hart St. from Plant St. to Tracy St.; York St. from end of present pavement to the Parkway; providing for the construction of water mains in Burrstone road from the end of the present main westerly to the city line, in Herkimer road from the end of the present main easterly to the city line and in Walker Ave. from its intersection with Trenton Ave. northeasterly 1,585 feet.

Washingtonville, N. Y.—The proposition to issue \$8,400 in bonds for new roads through the village, carried.

Asheville, N. C.—Several delegations appeared before the board of county commissioners asking for the construction or the resurfacing of roads in their various localities. Others asked to restore the French Broad River bridges, destroyed by the flood. Resolutions were adopted asking the commissioners to rebuild the bridges at their former sites and to appropriate the sum of \$50,000 for this work.

Asheville, N. C.—Petition to pave Gertrude Pl., Lawrence Pl., Evelyn Pl., Catherine Pl. and Edwin Pl. were presented to the city commissioners.

Asheville, N. C.—City Commissioners discussed new pavement for Patton Ave. Sentiment among members of the board is divided between asphalt on a concrete base, durax blocks and brick. A petition will be presented soon to the property owners for them to sign asking that the street be paved. Mayor Rankin is an advocate of asphalt as being more sanitary, noiseless and capable of being quickly laid.

Waynesville, N. C.—Residents of Waynesville and Haywood counties have determined to build a hard surface road from Turnpike to city.

Mt. Holly, N. C.—Bonds of \$5,000 to build sidewalks voted by city. W. T. Johnson, clerk.

Wilmington, N. C.—Chairman of the streets and wharves committee of the Chamber of Commerce ask Council to improve Water St.

Ashtabula, O.—For paving portion Gulf St., city making plans. L. A. Amsden, City Engr.

Canton, O.—County Comrs. decided to use all the state highway funds granted to the county in 1917 toward connecting Canton and Minerva by a paved road. After a conference with Highway Supt. Sickafosse, the comrs. decided to forward at once to State Highway Comr. Cowan the county's plan for using state funds.

Cleveland, O.—A program of road work, which provides for 50 miles of paving on 25 county roads and involving an expenditure of close to \$1,000,000 as the county's one-third share alone, was mapped out by County Engr. Stinchcomb for 1917. He declared contracts will all be awarded by March, if the necessary routine legislation can be disposed of. Among the roads listed are: Broadway Ave. from E. 34th St. to Miles Ave.; Detroit Ave. from W. 117th St. to Rocky River; Kinsman Rd. from the city limits to Warrensville Center Rd.; W. Lake Rd. from Rocky River to the West County line; and Bagley, Som Center, Harvard and Dover Center Rds.

Cincinnati, O.—The new estimate for the improvement of the Carthage-Hamilton Pike is \$148,400, against the old figure, \$135,000, of which the county will pay \$76,900. The last estimate on the other road is \$202,000, the old one being \$184,000. The county agreed to pay \$105,911 of this. Both roads will be improved with brick. They are Hamilton County's part of the Dixie Highway.

East Hamilton, O.—For about \$49,000, council plans paving East High St. F. E. Weaver, City Engr.

Hubbard, O.—Messrs. Durfee, Niles & Co., Toledo, sidewalk bonds; \$4,432. Successful bidders: J. W. Powers, Village Clerk.

Kent, O.—For 13,000 yds. paving on Lake St., 1,500 yds. in Columbus St., and 3,000 yds. on Prospect St. city receiving bids in March. F. Bechtel, Village Clk.

Middletown, O.—Resolutions will be presented to County Comrs. recommending brick for paving of Dixie Highway.

Montpelier, O.—Paving Broad, Washington, Jonesville and Water St., about \$42,000 city will receive bid. E. Summers, City Clk. G. Champe, Toledo, Engr.

New Boston, O.—Bids received in spring for 7,908 ft. brick road, about \$45,283. G. C. Kinley, Portsmouth, Engr.

Pioneer, O.—For paving First, State, Banbide, Church and Elm Sts.; also the bridge on Third St. and storm sewers in various streets, City has engaged L. A.

Bowlay, Co. Engr., 1248-51 Nicholas Bldg., Toledo, to make plans.

Toledo, O.—George Champe, Toledo engineer, is preparing plans and specifications for street improvements to be made in Montpelier, O.

Toledo, O.—See "Sewerage."

Toledo, O.—The County Comrs. have decided to proceed at once to build the Jackman Rd. from Central Ave. to Sylvia Ave.

Ardmore, Okla.—Jan. 13 election to vote road improvement bond; \$200,000.

Dustin, Okla.—Township will vote Jan. 15 road bonds to the amount of \$43,000.

Guthrie, Okla.—\$5,000 subscribed to assist in building Ozark trail across Logan county.

Eugene, Ore.—Report of budget committee of Lane County recommends the following as a tentative plan for the expenditure of the road and bridge funds during the coming year: Bridges, \$30,000; rock crushers, \$12,000; repairing macadam, \$5,000; tile and culverts, \$1,000; Pacific Highway, \$5,000; Coast Rd. (Eugene-Florence), \$15,000; Willamette Pass Road (Eugene-Klamath Falls), \$8,000; McKenzie Rd., \$15,000 Hayden bridge road, \$4,000; Junction City (connecting link), \$2,000.

Junction City, Ore.—Supervisor Ed. Ayers and taxpayers of District No. 45 discussed road matters. May spend \$2,000. For the Spring town road north past Hurlburt's Lake, \$500; Goodwin road, \$250; cross road between Lancaster and Monroe road, \$200; road from Lancaster north to Benton county line, \$250; general repairs and dragging, \$600.

Portland, Ore.—City Engr. Philip H. Dater has been instructed to prepare plans for hard-surfacing the Powell Valley Rd., a main traveled East Side thoroughfare, from Milwaukee St. to 21st, a distance of ten blocks.

Portland, Ore.—The locating and estimating work for 1917 road building has been practically completed by the county road department. This will enable the roadmaster to advertise for bids in January instead of next April and will assure an early start on the year's activities. The locating and estimating has been finished for the new Bertha-Beaverton road, six miles of the St. Helens road and the Wilson road. Of the 10 miles on the St. Helens road which is to be paved in 1917, six miles must be graded. Before the grading is completed, however, the paving can be started and the road all surfaced during the summer. Washington county has made preparations in its budget for the Bertha-to-Beaverton road and with Washington and Multnomah counties both working on this new road, it will be completed before autumn; is to be hard surfaced on a 4 per cent. grade.

Ebensburg, Pa.—Residents living in this community are anxious to have the County Comrs. award a contract for the remaining two miles of brick road to connect the brick road starting at Lake Rowena, on the Cresson Pike, with Munster. There still remains one mile of this brick road to be built by Messrs. Bennett & Shearer, of Indiana, next spring.

Erie, Pa.—See "Sewerage."

Greensburg, Pa.—Borough bonds, \$50,000, sold to Mellon National Bank, Pittsburgh. J. F. Beatty, Secretary Council.

Pottsville, Pa.—Mayor Mortimer recommends in his annual message to council paving of Division St. from 2d to 4th; installation of additional fire plugs and alarm boxes, especially on the East Side; police call system and purchase of a police patrol; purchase of sanitary drinking fountains; purchase of parks; widening of 11th St.; paving of Norwegian St. from Railroad to Coal; removal of Mahantogo St. crossing; erection of street signs; erection of speed limit signs; abandonment lighting system.

Scranton, Pa.—Ordinance providing for the laying of 4-ft. flagstone sidewalks on both sides of wood St., from Main Ave. to Diamond Ave.

Scranton, Pa.—Ordinance authorizing the grading, paving and curbing of Monsey Ave. from Larch St. to Green Ridge St.; also Marlon St., Delaware St. from Monsey Ave. to the Dunmore Borough line; Irving Ave. from Mulberry St. to Pine St.

Williamsport, Pa.—Report of City Engineer John B. Otto plans and surveys for the paving of the following streets have been made: Water St. from Fourth to Newberry St.; Dewey Ave. from Newberry St. to Erie Ave.; Erie Ave. from Dewey Ave. to Lycoming Creek; Race St. from Erie Ave. to city line; Court St. from Sixth to Seventh Sts.; Graffus St.

from Hepburn to Market Sts., and Packer St. from Market St. to Brandon Park. Plans were also made for an intercepting sewer from Basin St. down and across the river to Sarah J. Young's farm, and for disposal plant sites at foot of Arch St., north of the Keystone Hide Co.'s plant.

Cranston, R. I.—Mayor John W. Horton recommends, in his annual message, that the city council take charge of the building of sidewalks as an addition to its highway work.

Fort Mill, S. C.—Commercial organization will interest itself in having survey made and work begun on the new road which is to lead to the Cherry road bridge across Catawba River, and will endeavor to secure immediate attention to the matter. Repairs to Bailes bridge and the surfacing of the roads approaching.

Brady, Tex.—Election in the near future to vote on issuing Road District No. 2 bonds; \$30,000.

Dallas, Tex.—Petition of property owners on Rawlins St., from the south line of Oak Lawn Ave. to the south side of Wycliffe St., asking for bitulithic paving, was granted by the City Comrs.

Houston, Tex.—Links along White Oak Bayou and from Houston Heights Blvd. to Montrose Blvd. are planned. The "missing link" in Harrisburg Blvd. will be paved after the first of the year, and Washington Ave. paving will be completed.

Houston, Tex.—Definite steps were taken toward completion of Harrisburg road. County Engineer W. N. Thatcher was ordered to draw up plans and specifications for the work at a cost not exceeding \$19,500.

Norfolk, Va.—An effort will be made by the Chamber of Commerce on good roads to have the war department authorize immediate construction of a military highway from Norfolk to Cape Henry.

Norfolk, Va.—The finance committee approved the resolution providing for the widening and smooth paving of Bank St. north from Main St., and for the extension of the street through to Salter St.

Norfolk, Va.—Steps to have the State legislature cooperate with the Federal government in the construction of two improved highways from the Hampton Roads section to Richmond, one via Suffolk and the other via Williamsburg, as a part of the great national defense plan, were taken at the annual membership dinner of the Tidewater Automobile Association. The plan was launched by Harry B. Houston, speaker of the Virginia House of Delegates.

Norfolk, Va.—See "Miscellaneous."

Petersburg, Va.—The board of governors of the Chamber of Commerce conferred with citizens of Prince George, Surry and Isle of Wight counties in the matter of the route of the Richmond-Petersburg-Norfolk highway. Several proposed routes considered. Board of governors unanimously adopted a resolution favoring what is known as the "Old Stage Road" for the route for the proposed highway, and commending this to the supervisors of the several counties through which it passes.

Suffolk, Va.—For the Suffolk to Petersburg boulevard, a resolution offered by the Board of Supervisors of Isle of Wight county, asking the Nansemond county supervisors to endorse the Smithfield route, was not accepted.

Charleston, W. Va.—Citizens of Lowdon informed the \$90,000 bond issue for good roads will be sold within a few weeks.

Cheney, Wash.—A 15-mile extension to the Normal road is planned by citizens south of Cheney.

Ferndale, Wash.—Council will be petitioned for paving of two main streets.

North Yakima, Wash.—R. V. Hopper, city clerk, reports council has passed a resolution providing for the paving of 1st Ave. South, et al. with concrete, gravel bitulithic or some other hard-surfacing.

Puyallup, Wash.—The petition for the grading and graveling of Third St., S. W. between Pioneer Way and Fourth Ave., S. W. The laying of a storm sewer and any other improvement needed were referred to the street committee, members in all probability making a favorable report. The other street is Second Ave., N. E.

Seattle, Wash.—Resolution passed ordering establishment of Renton-O'Brien road.

Spokane, Wash.—Plans for a \$15,000 fill on Washington St. between 1st and

2d Aves. are being prepared by City Engineer Morton MacCartney.

Spokane, Wash.—Commissioners decide to improve Washington St. under Northern Pacific arch.

Green Bay, Wis.—City planning commissioners contemplates improvements to streets, sidewalk and bridges and will aim to motorize the fire department as soon as possible.

Green Bay, Wis.—Pavements will be constructed on South Broadway, Mason St. bridge approaches, Washington and Cedar Sts., Pine St. and Woodlawn Ave. during the coming season.

Milwaukee, Wis.—Mayor Hoan vetoed an item of \$400,000 set aside in the 1917 budget as a permanent paving fund. The mayor said if the item is reduced to at least \$325,000, it will equal that of last year. Under the new system, which results in paying contractors cash for their work, the reduced amount will insure a large amount of work.

Mondovi, Wis.—The election here resulted in favor of issuing street improvement bonds, \$40,000.

Almonte, Ont.—By law to raise \$15,000 for street and town property improvement was defeated.

Chatham, Ont.—City council plans to pave Lacroix St. Clerk, W. R. Merritt.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

San Diego, Cal.—To *G. R. Daley, paving, per sq. ft., 10 7-10 cts.; cement concrete sidewalks, per sq. ft., 12 cts.; cement concrete curb, per lin. ft., 40 cts.; improvement of Madison Ave., from the center line of Rhode Island St. produced south, to the west line of Park Blvd.

Washington, D. C.—District Comrs., D. E. Garges, Chief Clk., 427 District Bldg., let to *J. B. Mullin Co., 14th and Kennedy Sts., N. W., and *W. F. Cush, 201 S. St., N. W., for 201,000 cu. yds. grading.

Berwyn, Ill.—Street paving asphaltic concrete, 8,000 sq. yds., *Chicago Foundation Co., Chicago, Ill., F. J. Dolan, V. P., Fort Dearborn Bldg.

Chicago, Ill.—By Board of Local Improvements for 6-ft. cinder sidewalk, to *L. Hammar & A. C. Hammar.

Chicago, Ill.—By Board of Local Improvements for 6-ft. cinder sidewalk, to *Joseph Quinn, Jr.

Chicago, Ill.—Six-foot cinder sidewalk on a system of streets to *Peter Huiner, 1819 W. 13th St., by board of local improvements.

Joliet, Ill.—For improving Youngs Ave. from Cass to Jackson Sts., *R. F. Conway Asphalt Paving Co., 1931 Mendell St. Its competitor was the American Asphalt Paving Co., 133 W. Washington St., Chicago. The improvement is to be an asphaltic concrete pavement, laid on a natural foundation. The two main items are for the excavating on which the American bid 76 cts. per cu. yd., and the Conway Co. 92 cts. per yard, and the asphalt on which the American bid was \$1.42 per sq. yd. and that of the Conway \$1.35.

Bloomington, Ind.—Pike road by the county commissioners, two miles of the White Hall pike starting at the end of west Kirkwood Ave., *Campbell & Dobson, at \$15,000. The B. F. Cooter road in Bloomington township, to *Rogers & Brown for \$13,500. Will be 3 miles in length starting in just south of Dolan and running east to Unionville.

Greencastle, Ind.—*Bascom and Cyrus O'Hara of Greencastle, Ind., for road contracts for Madison, Monroe, Jackson, Floyd and Clinton townships, Putnam county, at \$11,535, macadam gravel.

Huntington, Ind.—Brick with asphalt filler and cement curbing were designated for the John St. improvement, to *Philip Mipskind & Sons, Richmond, Ind., for \$2.50 a sq. yd., the work to be completed by July 15.

Jeffersonville, Ind.—Board of County Commissioners for the construction of the Logan Coombs road in Charlestown township. Bidders: John D. Graninger, \$11,891.30; Herman Fischer and Samuel L. Gray, \$12,860; *Thomas F. O'Neil, \$12,898; Wilk & Co., of Rushville, \$13,395, and Wm. J. Pass, of Sellersburg, \$12,990.

Lebanon, Ind.—*Geo. T. Miller, of Lebanon, Ind., for construction of a concrete road for Boone county at a cost of \$25,847.

Lebanon, Ind.—Street paving gravel.

*Chas. C. Howard, Sheridan, Ind., R. F. D. 31, \$4,325.

Logansport, Ind.—County commissioners for the construction of roads in Cass county, aggregating an expenditure of \$20,285. *Harry A. Barnes, for the construction of the gravel road, 2½ miles long, in Bethlehem township, known as the Powell Rd., \$13,523. Other bidders: Palmer, Moore & Co., \$18,500; John Caw, \$16,481; Claude Brandt, \$19,461, and Harshman & Jarrell, Frankfort Ind., \$18,248. *Claude Brandt, for the construction of a stone road known as the Silas Storer Rd., in Washington township, \$6,762. Other bidders: Martin McHale, Logansport, Ind., \$7,497; H. A. Barnes, \$8,586; Taylor Gorton, \$6,789; D. A. Hyman, \$6,779, and Palmer, Moore & Co., \$7,800.

Monticello, Ind.—*J. H. Dav. of Monticello, Ind., for construction of White county roads, for \$6,825.

Vevay, Ind.—*O. W. Pegee, of Versailles, Ind., will construct the Cotton township road for Switzerland county, at a cost of \$5,725.

Quachita, La.—Parish of Ouachita, gravel road: *Womack Constr. Co., Kentwood, La., for 6 roads amounting to 70 miles in all, 16 ft. gravel surface, 24 ft. grade limit; prices amounting to approx. \$205,850; gravel to be furnished by Parish; \$150,000. R. P. Boyd, Res. Engr.

Pipestone, Minn.—Paving 14 blocks concrete to *Ganley Construction Co., Plymouth Bldg., Minneapolis, Minn.

Omaha, Neb.—For grading as follows: Emile, 40th & B St., *Kierle Construction Co., care Engineer; Curley lane to *Russell Condon, care Engineer, John A. Bruce, City Engr., by city.

Yonkers, N. Y.—Regulating and grading Allison Ave., to *Nicholas Mangini, 17 Cliff Ave., at \$37,509. Bidders were: Cuozzo, \$38,855; Cianfaglione, \$47,500; O'Rourke, \$57,100; Nolan, \$51,933.85; De Marco, \$43,524.

Asheville, N. C.—The question of renewing or making a new contract with the Asheville Paving Co. for the improvement of many miles of streets this year was considered by the city commissioners. Representatives of the paving company appeared before the board and there was an informal discussion of the matter, but no decision will be made by the commissioners for two weeks.

Cincinnati, O.—For repairing Given Rd., *Geo. W. Rich, for \$1,863, by the County Comrs. *W. Tautman was low bidder on the improvement of Clark Rd. at \$1,814.

Niles, O.—Engineer H. W. Turner, City Hall; H. A. Burgess, Director Pub. Service, City Hall, street surfacing: Church St. from State St. to Erie R. R., 3,500 yds. new wood block pavement, to *Jas. DeJute, Youngstown, O.

Pawnee, Okla.—*M. A. Swatek & Co., Oklahoma City, for vertical fiber brick paving, Dist. No. 4, Engr., Benham Engr. Co., Colcord Building, Oklahoma City, H. A. Rexroad, city clerk.

Arnold, Pa.—*W. W. Schultz, New Kensington, at \$7,400, grading, paving, curbing, 3,200 lin. ft. concrete curb and gutter, 5,500 cu. yds. grading, 1,600 lin. ft. brick paving on Drey St., between Victoria Ave. and Freeport Rd. Engr., Ben S. Dinsmore, New Kensington, Pa. Wm. McCable, boró, clerk, Arnold.

Taylor, Pa.—For 410 lin. ft. terra cotta pipe sewer in 14th and 15th St. sewer districts, Harry Hall, Engr., Head Bldg., Scranton, Pa. Boro. Council, John F. Tubbs, Pres., let contract to *A. C. Naegele, 530 Larch St., Dunmore, Pa., at about \$2,000.

Dallas, Tex.—Paving Annex Ave. from Munger Ave. to Ross Ave.: *Texas Bitulithic Co., Praetorian Bldg.

Galveston, Tex.—Bd. of County Comrs. let involving an outlay of more than \$128,000, divided between two bidders; was for the restoration of the seawall blvd. paving and sidewalks on the north and south sides of the roadway. *J. C. Kelso & Co. of Galveston, at \$55,637.50, for the brick block work: *Park Moran Co. of Ocmulgee, Okla., at \$72,375.36 for concrete work, being the sidewalks, curbing, capping and the 4-in. base under the brick roadway.

Houston, Tex.—Out of the original \$240,000 Harrisburg road fund created by the issuance of anticipation warrants two important highways were ordered paved by the county commissioners for the paving of the Clinton road on the Ship Channel was awarded to the *Eagle Lake Gravel Co. for \$7,030. Shell for the Kuykendall road, in the northern portion of the county, *W. D. Haden for \$1,500, while the contract for the con-

struction was awarded to *Henry Kline for \$1,340. Proposals were ordered for three cars of topping gravel for the Main St. cut-off road.

Fort Worth, Tex.—The *Texas Bitulithic Co. to pave May and Barnard Sts. by the city commission, Street Commissioner Littlejohn and City Engineer Von Zuben, pavement at \$2.08½ per s. yd.

Portsmouth, Va.—A boulevard between Norfolk and Virginia Beach is now assured. The Virginia Beach chamber of commerce has succeeded in raising \$1,000 and has awarded the contract for that portion of the road lying in the Seaboard district to *W. G. Davis. Work on the highway will begin in a few days, and it is expected that the entire boulevard will be completed by May 1. It will cost in excess of \$50,000. The boulevard will be built of different materials. From the city limits to Broad Creek it will be of concrete; from Broad Creek to Euclid it will be of gravel and clay, and from Euclid to Virginia Beach of sand and clay. To a great extent the new highway will follow the old road from Norfolk to Virginia Beach, except that all grade crossings will be eliminated and new rights of way surveyed in order to keep the road its entire length north of the Norfolk-Southern tracks. The boulevard will enter Virginia Beach at 17th St., where it will connect with the sand and clay road, which at this time extends almost half way to Cape Henry.

West Allis, Wis.—See "Sewerage."

SEWERAGE

San Francisco, Cal.—To relieve sewer congestion along the lower blocks of Jackson St. in the wholesale district, board of public works announced that the Jackson St. outfall sewer will be completed. Bids will be received in January. Cost, \$6,000.

Stamford, Conn.—Mayor John J. Treat recommends to council in annual message many street improvements: suggests that provision be made for representatives of the city to make a more careful investigation of certain methods of sewage disposal now in operation.

Waterbury, Conn.—Mayor Martin Scully in his message to council recommends better system of garbage collection and disposal, including an up-to-date incineration plant, a committee appointed to consider the main carries of the sewer system that has become inadequate for present day requirements, and will soon have to be rebuilt of sufficient size to meet the demands of the city.

Tampa, Fla.—A report was submitted by City Engineer R. D. Martin showing that repairs are necessary in many places to maintain and preserve the sewer system recently laid at heavy public expense. He detailed a long list of cracked manholes, leaky pipes, etc.; cost of the repairs was estimated at \$3,185, which, added to \$1,000 worth of extensions which the report said are needed, will make a total of \$4,135.

Columbia, Ga.—For \$60,000 bonds city plans to vote to install sewer over Cook's branch in northern part of city. W. O. Campbell, City Engr.

Alton, Ill.—City receiving bids for trunk sewer in Shield branch sewer district. T. H. Landon, City Engr.

Grayville, Ill.—For about 3,000 ft. of 12 to 42-in. pipe, 35 to 40 brick manholes and 135 inlets, city making plans. G. W. Courter, Mt. Carmel, Engr.

Indianapolis, Ind.—Resolutions adopted for local sewer in State and Terrace Aves. from Orange to 23 ft. north of Minnesota; also in First alley east of LaSalle, from 20th to 21st.

Mishawaka, Ind.—Board of public works passed a resolution for a sewer on W. 10th St.

Shelbyville, Ind.—Ordinance adopted providing for the Tompkins St. sewer.

Marshalltown, Ia.—Ordinance before Council for construction of a sanitary sewer system for the Fifth Ward.

Larned, Kan.—For about \$25,000, city making plans sewer main laterals and pumping plant. Black & Veatch, 507 Interstate Bldg., Kansas City, Mo., Engr.

New Orleans, La.—City plans sewer system, about \$260,000. W. J. Hardel, City Engr.

Newtown, L. I.—Petition for the construction of a sewer and appurtenances in Grand St., from Willow Ave. to Columbia place and in Columbia place from Grand St. to Brown place, Second Ward; in Packard St., from Greenpoint Ave. to Queens Blvd., First Ward.

Sikeston, Md.—See "Streets & Roads."
Beverly, Mass.—See "Streets and Roads."

Chicopee, Mass.—Messrs. E. C. Potter & Co., Boston, successful bidder, sewer bonds; \$4,800.

Fitchburg, Mass.—See "Streets and Roads."

Detroit, Mich.—Clarence W. Hubbell, City Engineer, will prepare estimates for the extensive sewer construction work in the old and the recently acquired territory. Must be ready for presentation to the new board of estimates by Feb. 6.

Scobey, Mont.—See "Water Supply."
Butler, N. J.—Will revise plans. State Board of Health rejects plans submitted by Pequannock Valley Paper Co for disposal plant.

Camden, N. J.—Ordinance authorizing the construction of sewers, culverts or drains in and along 30th St., from Carman St. to Mickle St.

Princeton, N. J.—Sewerage improvement considered by Borough Council. V. E. Cook, City Clerk.

Buffalo, N. Y.—William St. property owners ask for new sewers.

Elmira, N. Y.—The city is again called upon to install a sewage disposal plant.

Niagara Falls, N. Y.—City will be forced to build a sewer to take care of the effluent from the municipal filtration plant. The estimated cost of the sewer recommended by Mr. Carr is \$59,000. Adding the cost of the sewer from the water plant to Union St., the work would be an expense of about \$100,000.

Oneonta, N. Y.—For about \$60,000 city made plans for disposal plant.

Utica, N. Y.—See "Streets and Roads."

Yonkers, N. Y.—Edward Walsh, secretary of the board contract and supply was instructed to advertise for bids to be received at the next regular meeting for the construction of sewers in Montague St., Silk Place and Iselin St.

Cincinnati, O.—In an effort to get some cooperative action on the building of the Muddy Creek sewer in Westwood, a joint meeting has been called to be attended by the county commissioners, the trustees of Green township, the officials of the village of Cheviot and Bridgetown, the State Board of Health and Cincinnati officials, at which time it will be decided just what proportion of the cost each must assume.

Coshocton, O.—To build storm sewers in 16th St., city sold \$5,000 bonds. A. Fisher, City Engr.

Coshocton, O.—See "Water Supply."

Ironton, O.—Council passed ordinance for sanitary sewers. L. G. Howell, City Engr.

Pioneer, O.—See "Streets and Roads."

Salem, O.—Committee of council and committee of Chamber of Commerce recommends service director consult a sanitary engineer and get opinions to the advisability of reconstructing the present sewage disposal plant was referred to the service director, with instructions to act.

Toledo, O.—City Engineer McClure, in his annual report, urges elimination of dangerous grade crossings. City has plans ready for \$1,250,000 worth of street paving and \$200,000 worth of sewers. Watson Harmon, special sewer engineer, and A. A. Jones, assistant, report plans practically completed for the elimination of sewage from Ten Mile Creek.

Toledo, O.—Plans for a metropolitan sewer district in Lucas county will be outlined by city, county and state sanitary engineers. The district as proposed will include all of Toledo and portions of the county which probably will be annexed in the next 20 years. The meeting will be attended by W. H. Dittoe, sanitary engineer for the state board of health; L. A. Boulay, county sanitary engineer; Watson Harmon, city sanitary engineer; Prof. W. H. Hoad, sewage and drainage expert of the University of Michigan, and City Engineer McClure. The engineer will decide on a plant for the elimination of sewage from Ten Mile and Swan Creeks, to be submitted to the city council and state board of health.

Carnegie, Okla.—Sewer bonds, \$25,000, will be voted on in the near future.

Enid, Okla.—City will advertise soon for sewer to be constructed in Dist. 65. Approximately 1,660 lin. ft. 8-in. vitrified sewer, 3 manholes, 1 lamp hole. Plans complete. B. F. Lewis, City Engr.

Erie, Pa.—Expenditures mapped out for 1917 under the supervision of William D. Kinney, superintendent of the Department of Streets and Public Improvements. Construction will be started and more than half completed of the Mill Creek tunnel; estimated to cost

\$900,000. Plans will be completed, construction bids asked and work started on covering Garrison Run; cost, \$200,000. \$250,000 will be spent by council and the railroads on grade crossing elimination. Three subways will be completed, it is expected. Plans will be completed and work started on a \$200,000 sewerage treatment plant and intercepting sewer system. Water commissioners will spend \$200,000 for two pumps and reconstruction of the distribution system from the pumping station. The State St. conduit will be rebuilt, completed and extended and an ornamental lighting system placed at a total cost of \$30,000. \$10,000 will be spent on extension of the low tension conduit system. Five miles of streets will be paved, at a cost to property owners of \$200,000. Storm water and sanitary sewer systems will be extended throughout the city, at a cost of \$225,000. Grading of State St. from 26th to 32nd Sts. will be partially completed, at cost of \$20,000. A retaining wall probably will be built along West canal basin, at a cost to the State of \$25,000. Efforts will be made to get a state appropriation of \$300,000 for construction of a public freight dock at the foot of Peach St.

Erie, Pa.—Council passed Director Kinney's ordinance providing for construction of a 9-in. sanitary sewer in 27th St., from Raspberry St. 500 ft. east.

Harrisburg, Pa.—Among the permits and decrees issued by the Pennsylvania department of health, relative to sewerage during the period from Nov. 1 to Dec. 31, 1916, inclusive: Sayre—Approving plans for sewage treatment works, Dec. 16. Prospect Park—Approving a sewer extension and tentative scheme for treatment works, Dec. 16. Hanover Twp., Luzerne Co.—Approving plans for district sewer system and sewage treatment works, Dec. 28. Avonmore—Withholding approval of proposed sewer extension and requiring plans for a sanitary sewer system and treatment works, Dec. 30. Erie—Granting an extension of time for the construction of intercepting sewers and treatment works, Dec. 30. Philadelphia—Lateral sewer extensions, Dec. 30.

Williamsport, Pa.—City Engineer John B. Otto suggests that application be made at once to the state board of health for the approval of Farley Gannett's report on the sewage disposal question. With the condition that if any other system be found to be more desirable it might be adopted. There are a large number of sewers and pavements ready to construct.

Houston, Tex.—Construction of sanitary sewer mains for all unserved portions of the city are included in the extensive plans of the administration.

Puyallup, Wash.—See "Streets and Roads."

Spokane, Wash.—Plans for the new downtown intercepting sewer will be started by the city engineer's force so that they may be ready for presentation to the city council early in the spring. According to tentative plans, the new drain will link up with the present trunk at Main and Lincoln, run east to Main and Stevens, and thence south to Sprague Ave. From here a branch will run east to Bernard and another branch will run west and south to First and Howard. The new sewer will be a 66-in. pipe, with six or seven times the capacity of the present 24-in. drain. No close estimate on the cost of the drain has been made but it probably will run between \$30,000 and \$40,000.

Green Bay, Wis.—Approximately one mile of sewers will be constructed in the 18th sewer district at a cost of nearly \$50,000 this year, and the city engineer, F. A. Torkelson, is working on plans. A number of extensions will be made in other portions of the city.

Cobourg, Ont.—Ratepayers passed the sewerage by-law. Clerk, Ben Ewing.

St. Catharines, Ont.—The following estimates for the construction of a sewer system in the Facer St. district have been submitted to the City Council by City Engineer W. P. Near: Sanitary sewers, \$23,900; storm sewers, \$27,000; pump plant, \$7,000; disposal works, \$18,000.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Berwyn, Ill.—C. M. Porter, 161 Gale Ave., River Forest, Ill., for sewer extension, at \$20,000, on 22d and other streets. Engineer B. Strutzenberger, City Hall. Chas. Smith, Pres. Bd. of Local Improvements, City Hall. Vitrified tile, 12 to 24-in., 2½ miles long.

Rock Island, Ill.—Bids for the South Heights sewer system and septic tanks between 14th and 24th Sts. and 18th to Richmond Aves. Though the low bid was nearly \$1,000 more than the estimate, Mayor McConochie stated that the city would build the sewer as planned. The estimate is \$16,445 and the bid of P. J. Trenkenschub, who was low bidder, \$16,844. Other bid: D. E. Keele Construction Co. of Davenport, and the figure quoted was \$21,011.

Trenton, N. J.—For 8-in. terra cotta pipe sewer in Quarry St., L. L. Hirsch, City Clerk; H. C. Gregory, City Engr., to *A. Calantano, 509 Bridge St., \$2,000.

Syracuse, N. Y.—*Charles Bonn, 207 Delhi St., at about \$1,521, for sewer on state fair grounds. State Fair Comm., Albert E. Brown, Secy., Cahill Bldg.

Yonkers, N. Y.—For a sewer in Allison Ave., easterly and northerly, to *Nicholas Mangini, 17 Cliff Ave., Yonkers, at \$3,200. Bidders were: Guozzo, \$3,329; Ciancuilli & Sons, \$3,280.57; Frank Cianfaglione, \$4,600; Joseph De Marco, \$3,593.

Yonkers, N. Y.—*Joseph Ciancuilli, 41 Western Ave., for the construction of a sewer in Allison Ave., \$6,928.07. Bidders were: Mangini, \$7,472; Cianfaglione, \$10,000; De Marco, \$8,160.

Yonkers, N. Y.—Awarding a contract for the construction of a house and storm water sewer in Lake Ave. was laid over as all the bids were considerably higher than the estimates figured by City Engineer Fulton. Joseph O'Rourke Construction Co., \$10,414.60; Nicholas Mangini, \$10,500; O'Rourke Construction Co., \$10,842; M. J. Nolan, \$30,125.

Cincinnati, O.—For sewers, *Henkel & Sullivan, 414 Walnut St., as follows: 670 ft. 8 to 12-in. tile and 7 brick manholes in Schoodinger Ave. and Lierman St., at \$1,630; 578 lin. ft. 8 to 15-in. tile, 4 brick manholes, 7 street inlets, 20 T branches, 60 lin. ft. 12-in. vit. tile in Mason St., at \$5,420; 1,310 lin. ft. 12 and 22-in. tile, 7 manholes, 2 street inlets, 79 T branches, 60 lin. ft. 12-in. vit. pipe in Verne Ave., at \$3,585. Frank S. Krug, City Engr., City Hall. Dept. of Pub. Service, C. F. Hornberger, Dir.

Hamilton, O.—It is expected that the city board of control will award the contract for the Lindenwald sanitary sewer system to the John L. Walker Co., at its bid of \$52,865. Other bids as tabulated by City Engineer Frank Weaver were: L. A. Dillon, \$57,348.30; Chas. Smith & Co., Dayton, \$56,768.20. The engineer's estimate was \$53,187.50.

Painesville, O.—*Rose & Faulkner, at \$1,360, Bd. of Pub. Service, S. A. Haskell, Dir., City Bldg., for 1,100 lin. ft. 6 and 10-in. vit. tile pipe sewer, 44 10x6 ft. Y's and 4 brick manholes in S. State St. J. M. Crabbe, City Engr., City Bldg.

Wetumka, Okla.—See "Water Supply."

Allentown, Pa.—For constructing storm sewers; bids opened by city Dec. 26 (Chas. S. Weirbach, City Engr.): Tighman St. sewer, *Geo. H. Harder, Allentown, at \$22,256. Following is unit bid: 100 lin. ft. special timber box culvert section, \$4.50; 623 lin. ft. 48-in. circular monolithic concrete sewer, \$4.55; 1,860 lin. ft. 42-in. circular monolithic concrete sewer, \$5; 300 lin. ft. 36-in. circular monolithic sewer, \$3.76; 620 lin. ft. 24-in. d-s vitrified pipe sewer, \$2.80; 13 circular stand. brick manholes, \$58; four 30-in. "A" inlets, \$102; three 36-in. "A" inlets, \$126; five 30-in. "C" inlets, \$108; one 36-in. "C" inlet, \$102; 18 30-in. "E" inlets, \$110; two 36-in. "E" inlets, \$112; 1,100 cu. yds. rock excav., \$1.50; extra earth excav., 75 cts.; extra 1:2:4 concrete in place (incl. forms), \$10; 200 lin. ft. 15-in. vit. pipe sewer, \$1.57; one cir. standard brick manhole, \$58; one 30-in. "A" inlet, \$108; two 30-in. "E" inlets, \$96; one 36-in. "D" inlet, \$100. Sumner Ave. sewer, *Geo. K. Hardner, Allentown, at \$25,094. Following is unit bid: 1,309 lin. ft. 7 ft. 3 in. x 8 ft. 4 ins. rein. coner. box cul. sewer, \$15.48; two circular con. manholes, \$35; two Plan "G" inlets, \$50; one special inlet, \$50; 2,500 cu. yds. rock excav., \$1.90; extra earth excav., 75 cts. E. Maple and E. Clair Sts., *Weaver Constr. Co., Allentown, at \$23,837, with brick invert. Following is unit bid: 2,570 lin. ft. 48-in. cir. mon. con. sewer, \$7.25; 600 lin. ft. brick invert in above (optional with city), 50 cts.; 2,570 lin. ft. 48-in. cir. rein. con pipe sewer, \$8; segment block sewer, \$7.25; 86 lin. ft. d-s vitr. pipe sewer, 24-in., \$3; ten cir. standard brick manholes, \$50; one 36-in. "B" inlet, \$95; one 30-in. "C" inlet, 90; one 36-in. "C" inlet, \$95; four 30-in. "D" inlets, \$90; two 36-in. "D" inlets, \$95; eight 30-in. "E" inlets, \$90; three 36-in. "E" inlets, \$95; 475 lin. ft. 6x8-in. stan. "B" inlet, \$95; one 30-in. "C" inlet, \$90;

con. curb, 55 cts.; 925 lin. ft. 24x8 in. ctd. con. gutter, 46 cts.; 650 cu. yds. rock excavation, \$2.50; extra earth excavation, 75 cts.; 1:2:4 con. in place (incl. forms), \$6.50. Oak and Howard relief sewer, to *Schaeffer & Ackerman, Allentown, at \$4.873, for monolithic concrete, and Lehigh St. to *Continental Contr. Co., Baltimore, at \$5.355, for vitr. pipe.

Hanover, Pa.—Ordinance authorizing the borough to enter into a contract with the Hanover & McSherrystown Water Co. for furnishing water for the borough for fire and other purposes was approved. Company will furnish free water for the fountain at Wirt Park, all water used for fire practice, and for street cleaning and fire apparatus testing, for \$1,800 per year.

Pittsburgh, Pa.—For sewers as follows: 693 lin. ft. 15-in. terra cotta sewer, 3 brick manholes and castings on Manette Way and Rodman St.; sewer in Heberton St., 540 lin. ft. 9, 12 and 15-in. terra cotta sewer and 4 brick manholes in Rapidan Way and 690 lin. ft. 12 and 15-in. terra cotta sewer and 5 brick manholes in Shetland av., *Christ Donatella, 1313 Collier St., at \$1,723, \$951, \$494 and \$1,229; 336 ft. 18-in. terra cotta sewer, 2 brick manholes and castings in Academy Lane and 1,050 ft. 9 and 15-in. terra cotta sewer, 3 brick manholes and castings to *F. & F. Diulus, 40 Boundary St.; 386 lin. ft. 9 to 15-in. terra cotta sewer and 1 brick manhole in Wendover St., 374 lin. ft. 15-in. terra cotta sewer, 2 brick manholes in Dolphin Way, and 758 ft. 15-in. terra cotta sewer, 4 brick manholes and castings, to *Manella Constr. Co., 1507 N. Lang St.; 742 ft. 9 and 15-in. terra cotta sewer, 4 brick manholes and covers in Orlando Way, to *Geo. S. White Co., Jenkins Arcade, at \$1,219; 1,590 ft. 12 and 15-in. terra cotta sewer, 8 brick manholes and castings, 2 concrete catch basins and castings in Cordova Rd., to *J. E. Born, 441 Shady Ave., at \$2,809; 360 lin. ft. 15-in. terra cotta sewer and brick manholes in Rudolph and Campau Way, 428 lin. ft. 15-in. terra cotta sewer and 1 brick manhole in Monteiro, near Graphic St., and 1,395 lin. ft. 15-in. terra cotta sewer and 4 brick manholes, to *Thos. Cronin Co., 17th and Muriel Sts. The city council, Jos. Armstrong, mayor.

West Allis, Wis.—City Clerk A. Wichener has notified property owners on the following streets that contracts have been awarded for the installation of water and sewer mains. Part of 50th Ave., 77th Ave. from John St. to Lincoln Ave., 68th ave. from George St. to the south city limits. The sewers will be installed in the early spring, as soon as the work can be started. The contract work on the following streets has been completed: 62nd Ave., from Elm St. to National Ave.; 67th Ave., from Pullen Ave. north to the north line of Fairview Park; 60th Ave., from Burnham to George Sts.; 68th Ave., from Shenners to Spring Meadow Aves.

Vancouver, B. C.—*Dominion Glazed Pipe Co., for 1,200 ft. of concrete sewer pipe to be laid along Fifth Ave., \$2,016.

WATER SUPPLY

Fayetteville, Ark.—H. Lour, Supt., city, made plans for filter plant.

Sunnyvale, Cal.—Sealed bids, Jan. 15, for water extension; \$15,000 fire protection. Town Clerk Ida Trubschenck.

Washington, D. C.—Bureau of Foreign and Domestic Commerce, Department of Commerce: A company in India wishes to receive catalogues and full information from American manufacturers of modern aerated water plants. Quotations are desired c. i. f. foreign port. Correspondence may be in English. Reference, Refer to Opportunity No. 23401.

Tampa, Fla.—Citizens of Gary will discuss the need of a bond issue for providing water and fire protection.

Damascus, Ga.—C. H. Coffin, Chicago, successful bidder for light and water plant bond; \$10,000. J. D. Haddock, mayor.

Fayette, Ida.—The election defeated water works bonds to the amount of \$12,000. Martin O. Luther, city clerk.

Riverdale, Ill.—Water bonds, \$6,000, awarded the First National Bank of Dalton.

Huntington, Ind.—A motion to require property owners having more than one water meter on a single line to change the plumbing to provide a separate line for each meter carried.

Bancroft, Ia.—Town is considering the question of issuing water main bonds for \$15,000.

Midvale, Ia.—A special election will be held Jan. 15 to vote on the question of

issuing water works bonds to the amount of \$12,000.

Mitchellville, Ia.—Petitions asking that an election be called to vote on issuing water bonds for \$5,000.

Walnut, Ia.—For drilling artesian well, city is receiving bids.

El Dorado, Kan.—City is considering a \$50,000 bond issue for the purpose of installing a water filtration plant.

Farmington, Mass.—Water bonds, \$10,000, Messrs. Blodget & Co., Boston, successful bidders.

Fitchburg, Mass.—See "Streets and Roads."

Duluth, Minn.—Resolutions approved that the manager of the water and light department be authorized to sell second-hand addressing machine, stencil cutter, four sections with trays and frames to J. M. Gidding Co. for the sum of \$70.

Brookfield, Mo.—Water works bond issue, \$63,000; defeated at recent election.

Clarence, Mo.—E. W. Ragland, City Clk., city plans water works.

Oronogo, Mo.—The proposition to issue water works system improvement bonds to the amount of \$10,000 defeated.

Stockton, Mo.—\$20,000 water bonds purchased by Little & Hays Investment Co., of St. Louis.

Seabey, Mont.—\$75,000 bonds city plans to vote to build water, sewer and electric light systems.

Burlington, N. J.—Resolutions adopted city clerk to advertise for bids for bonds under the water and drainage ordinance.

Perth Amboy, N. J.—Water commissioners plan improving water system. A. H. Crowell, Supt.

Wood Ridge, N. J.—Mayor Gramlich recommends in his annual message that the borough take up the question of a water supply for the heights section west of the trolley.

Dolgeville, N. Y.—Report of Assistant Engr. C. M. Baker, urges the immediate installation of a purification plant.

Hamilton, N. Y.—Water and light plant bonds carried at election for \$12,000.

Utica, N. Y.—Mayor James D. Smith in his message to council recommends municipal ownership of the city water supply.

Coshocton, O.—Storm water and sewer bonds; the Commercial National Bank of Coshocton, successful bidder; \$5,000. Hugh Gamble, city aud.

Howe, Okla.—Water works and electric light bonds, \$40,000, sold to D. B. Welty of Oklahoma City. Howard Wellborn, Jr., president Board of Trustees.

Erie, Pa.—See Sewerage.

Harrisburg, Pa.—Among the permits and decrees issued by the Pennsylvania department of health relative to water works during the period from Nov. 1 to Dec. 31, 1916, inclusive: Altoona—Temporary germicidal treatment, Nov. 17. Clymer (Clymer Citizens Water Co.)—Approving well and spring supply, Nov. 23. Greene Twp., Franklin Co. (Fayetteville Water Co.)—Approving extensions to distributing system and temporary disinfecting apparatus, Nov. 23. Smith Twp., Washington Co. (Chartiers Mining Co.)—Approving additional spring supply, Nov. 23. Allison Twp., Clinton Co. (Lock Haven Suburban Water Co., formerly West End Water Co.)—Approving new sources of supply and requiring temporary germicidal treatment pending permanent improvements, Dec. 16. Bald Eagle Twp., Clinton Co. (Bald Eagle Twp. Water Co.)—Approving water works system, Dec. 16. Castanca Twp., Clinton Co. (Castaanca Water Co.)—Approving water works system, Dec. 16. Flemington (Flemington Water Co.)—Approving water works system, Dec. 16. Mill Mall (Crystal Pure Water Co.)—Approving water works system, Dec. 16. Woodward Twp., Clinton Co. (Woodward Twp. Water Co.)—Approving water works system, Dec. 16. Somerset—Approving plans for emergency disinfecting apparatus, Dec. 30.

Puaxutawney, Pa.—City plans voting bonds to install water system. C. E. Ratz, Supt.

Reading, Pa.—City purchased Glenside Water Co., Glenside, plans extending and improving. E. L. Nuebling, Supt.

Clover, S. C.—Water works bonds amounting to \$30,000; R. E. Marshall & Bro., of Charleston, successful bidders.

Bristol, Tenn.—City contemplates improvements to the water works system; to issue \$75,000 bonds.

Houston, Tex.—City intends to start work soon on a water plant in the South Side, adjoining Hermann Park, for another pumping station and well center for water system.

San Marcos, Tex.—W. G. Barker made plans sinking 18-in. well.

Farmville, Va.—Baker Watts & Co., Baltimore, successful bidders, water bonds, \$15,000. H. A. Stecker, town clerk.

Seattle, Wash.—City council to order the improvement of 25th Ave. South, from Holgate St. to Rainier Ave., by constructing water mains.

Tolt, Wash.—Special election Jan. 23, for proposed bond issue of \$21,000. Purchase of present water system and construction of new impounding reservoir, together with laying of 1½ miles of 8-in. wood stave main. Thomas Bird, City Clerk.

Clinton, Ont.—Water works extension by-law was carried. Clerk, D. L. Macpherson.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Southport, N. C.—City has signed a contract with the federal government to furnish Fort Caswell with water. The government is to build the pipe line from the fort, making its connection at this side. This is to be started at once, the estimated cost being \$30,000. The water price is 14 cts. per 1,000 gallons for the first 75,000 gallons; above 75,000 to 100,000 gallons, 13 cts. per 1,000, and above 100,000, 11 cts.

Erie, Pa.—Water commissioners, for improvements and new machinery for the pumping station of the water works, estimated to cost \$80,000. The *R. D. Wood Co., 400 Chestnut St., Philadelphia, for furnishing \$40,000 worth of pipe and material for new piping system and discharge line outside the station, and for a \$14,700 low duty pump of 20,000,000 gals. capacity, designed for service between the pumping station and the filter plant. The *Pitt Construction Co., Fulton Bldg., Pittsburgh, completed preliminary details for constructing the new pipe line, on which it bid \$20,000. Smaller contracts have been made with the *Eddy Valve Co., of Troy, for \$4,500 worth of valves; and the *Simplex Valve Co., Philadelphia, for a \$1,684 meter.

Providence, R. I.—A rechecking of the bids opened by the water supply board showed that the contract for diverting the Pawtuxet River and building the water gate near Kent will go for a full \$30,000 under the minimum estimates of the engineers. The lowest bid of the 16 received was almost exactly \$133,000, while the estimates had indicated that the work would cost from \$165,000 to \$175,000. The contract has not been awarded as yet and will not be in all probability for several days. The lowest bidder and the one to which the work will doubtless go is the E. W. Foley Contracting Corporation. The figures offered by the competing companies follow: Mason Hilton Co., \$162,490; Beaver Engineering & Contracting Co., \$133,590; Fred T. Ley & Co., Inc., \$159,216; Crown Bar Construction Co., \$208,655; C. W. Blakeslee & Son, \$142,060; Philip Cendella, \$268,700; Winston & Co., \$146,250; Bruno & Petteti, \$201,750; American Pipe & Construction Co., \$212,160; R. H. Newell Co., \$170,270; Wilson & English Construction Co., \$165,980; Michael Staub, \$135,405; J. A. Gillespie Co., \$154,420; E. W. Foley Contracting Corporation, \$133,490; F. F. Shanley Co., \$151,650; H. P. Converse & Co., \$172,810.

West Allis, Wis.—See "Sewerage."

Maillardville, B. C.—Installing the water system, *George Proulx, for excavation, etc., at \$1,385, and *Gordon & Campbell, Vancouver, the contract for supplying material.

Winnipeg, Man.—For the construction of the Deacon-Red River section of the Shoal Lake aqueduct for \$1,308,753, by the administration board of the Greater Winnipeg Water District, to *Winnipeg Aqueduct Construction Co.

MISCELLANEOUS.

Los Angeles, Cal.—Engineer instructed to investigate and report to the council the probable cost of the construction of a drain to care for the gutter drainage in the vicinity of Bunker Hill Ave. and California St.

San Diego, Cal.—The council directed the city attorney to prepare an ordinance calling a special election to vote \$682,000 in bonds to rebuild the Lower Otay Dam. The city attorney stated that the special election could be held prior to the regular municipal election next April.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
Ind., Indianapolis	10 a.m., Jan. 17	Curbing and improving streets	B. J. T. Jeup, City Engr.	
Ind., Lebanon	7.30 p.m., Jan. 22	Paving Indianapolis Ave.	Wm. Smith, City Clerk.	
Mich., Detroit	10 a.m., Jan. 22	Furnishing 1,000-ton bermudez asphalt; 2,100 tons asphaltic oil; sand and gravel; 2,000 tons refined asphalt; 5,000 tons limestone dust, and 2,500 tons asphalt stone.	G. H. Fenkell, Comr. Pub. Wks.	
Ind., Winchester	10 a.m., Jan. 29	Constructing county highway	C. E. Tillson, Co. Aud.	
Ind., Connersville	2 p.m., Feb. 5	Constructing gravel road	Glen Zell, Co. Aud.	
Ind., Wabash	10 a.m., Feb. 6	Five gravel and two stone roads	F. P. Kircher, Co. Aud.	
SEWERAGE.				
O., Cincinnati	noon, Jan. 18	Constructing sewers in several streets (four jobs)	Chief Engr., Dept. Pub. Serv.	
WATER SUPPLY.				
Mass., Fall River	11 a.m., Jan. 13	Supplying water meters during 1917	J. J. Kirby, Clerk.	
MISCELLANEOUS.				
Mass., Boston	noon, Jan. 15	Furnishing motor street sprinkling, flushing and oil spreading trucks	E. F. Murphy, Comr. Pub. Wks.	
Mass., Boston	noon, Jan. 18	Cleaning 10,900 catch basins	E. F. Murphy, Comr. Pub. Wks.	
Ind., Wabash	10 a.m., Jan. 23	Ornamental lighting system for Huntington St. bridge	F. P. Kircher, Co. Aud.	

STREETS AND ROADS

Fresno, Cal.—Resolutions for improvement of alley in block 38 from the northwesterly line of Kern St. to the southeasterly line of Tulare St., be graded, curbed with redwood curbing and paved with a pavement consisting of a 4-in. cement concrete base and a 1½-in. bitulithic wearing surface.

Fresno, Cal.—The committee of the Fresno Merchants' Association appointed to improve roads from Fresno to Yosemite, will take up with the Board of Supervisors the matter of building a road from Auberry to the bridge over the San Joaquin River. The distance is about five miles. The bit of road was included in the scheme of highways in the proposed \$3,600,000 road bond issue. As the bond issue failed to pass, it will now be necessary for the county supervisors to construct the road. A survey has already been made.

Belleville, Ill.—St. Clair County Board of Supervisors will be asked to call a special election in April for another vote on the good roads bonds issue. The issue will be for \$900,000 instead of \$1,500,000 as at the November election.

Greencastle, Ind.—Bids received Feb. 5, 1917, at 1 p. m., by treasurer of Putnam county, for sale \$7,400 and \$5,100 highway improvement bonds, 4½ per cent., ten years. H. H. Runyan, Treasurer.

Indianapolis, Ind.—Resolutions adopted for Hiatt St. from Miller to Minnesota, curb; McCarty St. from Fletcher to Shelby, permanent improvement; First alley west of Capitol from Maple to 40th, permanent improvement; College Ave. (w. s.) from 27th to Fall Creek, cement walks; First alley south of Fletcher from State to Nelson, permanent improvement; Centennial St. from 10th to 12th, curb, cement walks; 36th St. from Central to Fairfield, permanent improvement; College Ave. from 33d to 34th, permanent improvement; Central from 43d to 46th and 50th Sts., cement walks; Hiatt St. from Howard to Minnesota, grade and gravel; Gladstone Ave. from Michigan to Byram, grade and gravel; Kappes from Howard to Minnesota, cement walks; 43d from Meridian to Illinois, cement walks; Highland Place from 24th to 26th, cement walks; McCarty from Illinois to West, cement walks; First alley east of Broadway from 30th to 31st, permanent improvement; Centennial St. from 10th to 12th, grade and gravel; Hiatt St. from Miller to Minnesota, cement walks; Kappes St. from Howard to Minnesota, cement walks.

Indianapolis, Ind.—Resolutions adopted for 12th St. from Canal to West, permanent improvement; 12th St. from Senate Ave. to Canal, permanent improvement; Emerson Ave. from Frank St. to 10th, curb; Tremont Ave. from McCarty to Morris, cement walks and curb; Washington St. from Belmont to 72 ft. west of 1st alley west of Harris, permanent improvement; Parkway from Madison to East, permanent improvement; Washington Blvd. from 43d to 49th, cement walks; 39th St. from Byram to Conser cement walks; Guilford Ave. from 36th to Maple

road, permanent improvement; Newman from 10th to 12th, permanent improvement; 14th St. from Meridian to Pennsylvania, cement walks; 39th from Byram to Conser, grade, gravel and curb; Emerson from Frank to St. Clair, grade and gravel; Leonard St. from Sanders to Minnesota, permanent improvement; Leonard from Sanders to 45th ft. south, curb; First alley east of New Jersey St., from 28th to 29th, permanent improvement; Broadway from 46th to 48th, cement walks; Park Ave. from 46th to 48th, cement walks.

Fort Wayne, Ind.—A petition for walks on the east side of Harrison St. from Darrow Ave. to Rudisill Blvd.

Warsaw, Ind.—Bids received Jan. 18, 1917, at 2 p. m., by treasurer of Kosciusko county, for sale \$36,000 highway improvement bonds, 4½ per cent., ten years. A. J. Logan, Treasurer.

Boston, Mass.—See "Miscellaneous."

Portland, Me.—City Council voted unanimously to apply to the State Highway Department for five-times state aid. Will give city between \$60,000 and \$100,000 to be expended this year on the thoroughfares of the city.

Jackson, Mich.—Jackson county will vote a \$900,000 bond issue for the construction of east and west and north and south trunk line concrete highways.

Pontiac, Mich.—The county road commissioners made formal application for issuance of the remaining \$500,000 bonds of the third and fourth series of the Oakland county road issue.

Minneapolis, Minn.—For extending streets as follows: Eighth St. S. from Hennepin Ave. to Nicollet Ave., includes grading, creosote block paving, sewer and water connections; W. 47th St. from Beard Ave. S. to Chowen Ave., Beard Ave. S. from W. 50th St. to W. 52d St.; Zenith Ave. S. between W. 43d and W. 44th St.; Abbott Ave. S. between W. 43d and W. 44th St.; Sheridan Ave. N. between 26th Ave. N. and 27th Ave. N. Council directs City Engineer F. W. Cappelen to make estimates.

Minneapolis, Minn.—Council authorizes the following street improvements: Abbott Ave. S. between 47th and 54th Sts., estimate \$7,440; Summit Pl. between Gladstone and High View Aves., estimate \$328; Queen Ave. S. between Cromwell drive and 53d St., estimate \$743; Cromwell drive, bet. Penn Ave. and S. Russell Ave. N., estimate \$457; 39th Ave. N., bet. Penn Ave. and Xerxes Ave., estimate \$3,734; W. 45th St., bet. Pleasant and Bryant Aves., \$6,212; Morgan Ave. N., bet. 34th Ave. and 36th Ave., estimate \$2,208. City Engineer F. W. Cappelen.

St. Paul, Minn.—Ramsey county macadam paving will let contract in spring. Bald Eagle Lake Ave. from Buffalo St. to St. P. & D. Ry., one-half mile, Co. Surveyor, J. H. Armstrong; Co. Auditor, Geo. J. Ries, both Court House, St. Paul.

St. Joseph, Mo.—Board of Public Works considering again resurfacing the stretch of brick pavement on King Hill Ave. from Missouri to Alabama Aves., South Side.

Camden, N. J.—East Camden secured appropriations of \$4,000 to improve the

roadbed of several of unpaved thoroughfares. Will purchase a scraper.

Alexandria, N. Y.—Suggestions made to the National Park Conference by A. B. Casselman as the next stage in the development of Washington's park system, boulevard on both sides of the Potomac River from Washington to Great Falls; a bridge across the Potomac at Great Falls connecting these boulevards; boulevard from Washington south to Mt. Vernon, connecting with the upper Potomac Park development.

Canastota, N. Y.—Designations for road constructed presented by Supervisor F. Campbell, chairman of the highway committee of the town and county system, were adopted by the Madison County Board of Supervisors in session at Wampsville. The work called for a total of 26½ miles, but following a discussion it was thought advisable not to build to exceed 23 miles this year. The mileage in the different towns are as follows: Brookfield, 2½ miles; Deruyter, 1½ mile; Eaton, 1½ mile; Fenner, 2 miles; Hamilton, 1½ mile; Lebanon, 1½ mile; Lincoln, 1 mile; Madison, 2 miles; stockbridge, 2½ miles; Sullivan, 2.85 miles, and Smithfield, 1 mile.

Newtown, L. I.—Newtown local board adopted resolutions calling for the regulating, grading, curbing, laying sidewalks and crosswalks and for the construction of gutters in Roosevelt Ave. from a point 200 ft. east of Alburts Ave. to Woodside Ave.; Skillman Ave. from Woodside Ave. to Fifth St., and Woodside Ave. from Fifth St. to Eighth St., Woodside. Estimated cost will be about \$79,000, or \$4.40 a front ft. This is to be covered by an assessed valuation of \$990,000.

Tiffin, O.—This year will witness the advent of brick road construction in Seneca county. Steps have been taken for construction of a part of the Columbus-Sandusky pike through the east end of the county. The commissioners will brick a part of the Tiffin-Fostoria road and probably the Tiffin-Upper Sandusky road.

Oklahoma City, Okla.—Resolutions approving the city engineer's plans, specifications and estimates and declaring it necessary to pave and otherwise improve certain streets and avenues.

Mahanoy, Pa.—Ordinance for the paving of parts of East Centre, East Pine, East Mahanoy, West Centre, South Catawissa, 14th, Eighth, Fourth, Linden and D Sts.; paved with vitrified brick, asphalt, wood block or macadam.

Pottsville, Pa.—Special election for \$100,000 loan in spring for street improvements.

York, Pa.—Ordinance for the widening of West Mason Ave. from West St. west for a distance of about 50 ft.

Wilkes-Barre, Pa.—A sale of city bonds amounting to \$28,200 in sums of \$100 and \$500 brought premiums averaging \$1.80 and \$1.85 per \$100. Only two bonds were sold for less than \$1.75. The last two were sold for \$1.86 per \$100. The city got about \$530 in premiums. The bonds provide for the paying of the following streets: Horton, Brook, Westminster,

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Beech, Murray, Jones, Reese, Taft and Mead; also Garnet and Dougher lanes. The following shows the bonds sold and the premiums bid: W. E. Schaeffer, 500 at \$1.50; 500 at \$1.50; 500 at \$1.75; 1,000 at \$1.80; 3,000 at \$1.85; H. F. Fell, 1,000 at \$1.75; 200 at \$1.86; Charles E. Keck, 1,500 at \$1.80; 3,500 at \$1.85; German Y. M. Society, 1,500 at \$1.80; 500 at \$1.81; Frank Kelly, 1,000 at \$1.90; 2,500 at \$1.85; Olin Shaver, 500 at \$1.80; John Jones, 1,500 at \$1.85; E. W. Hoeffling, 1,000 at \$1.85; Sons of Liberty, 4,000 at \$1.85; J. P. Warnick, 2,000 at \$1.85; Mrs. Chester White, 1,500 at \$1.85; Mrs. C. R. Ogden, 500 at \$1.85; total, \$28,200.

Beaumont, Tex.—A petition was received from the residents of Cheek to have a shell road constructed from that place to La Belle; asked for an improved highway 9 ft. in width.

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Beaumont, Tex.—Auditor Barry was authorized to advertise for bids for 10,000 cu. yds. of clam and 10,000 cu. yds. of oyster shell to be delivered to Beaumont to be used in road work.

Charleston, W. Va.—See "Sewerage."
Lynchburg, Va.—Petitions for improvement to Cleveland Ave. and for paving on Pierce St., between Park Ave. and 12th St., referred to street committee.

Lynchburg, Va.—Sixty good roads advocates from Campbell, Amherst, Nelson, Halifax and Rockbridge counties, Durham, N. C., and Lynchburg, formed a Lee-Jackson Highway Association. The object is to secure federal, state and county aid for a highway from Staunton to Durham, this forming a link to a modern road from Canada to Florida.

Norfolk, Va.—The road and bridge commission of Norfolk county approved the

petition of Dr. W. B. Bradley, who is vice-president for Norfolk county for the Norfolk-Richmond Highway Association, that federal aid for the Norfolk to Richmond highway be requested of the federal authorities.

Olivet, Wis.—Board of Supervisors, Superior, Wis., construction of road from Olivet to South Superior, about \$27,000.

North Vancouver, B. C.—Council decided to macadamize Pemberton Ave., from Robson St. to the water front. The work is estimated to cost \$1,200. J. G. Farmer, Clerk.

Victoria, B. C.—City has under consideration construction of 70-mile highway in co-operation with Vancouver Board of Trade between Hope and Princeton as part of proposed Canadian National highway.

Hamilton, Ont.—The Provincial Government has been petitioned by the municipalities concerned to make surveys and estimate of the cost of a highway between Hamilton and Beamsville.

Listowel, Ont.—The by-laws for road improvements was defeated.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Washington, D. C.—*W. F. Brenizer Co., 141 Q St., N. W., for 6,700 cu. yds. grading on Gault St., District Comrs., D. E. Garges, Chief Clerk, 427 District Bldg.

Greensburg, Ind.—Decatur county concrete (1), macadam (3). Bidders: Moor & Crisco, Letts, Ind., concrete, total \$10,749.98; Thomson & Davis, Greensburg, Ind., macadam, \$12,230, and \$1,450; Reed & Elliott, Greensburg, Ind., \$8,449.89.

Baltimore, Md.—Contracts for street paving, Contract No. 9, concrete around various city property, *Slingluff-Brown Co., 1485 Munsey Bldg., Contract No. 16, concrete in various alleys, *Arthur Farmer, 105 N. Payson St., Contract No. 17, concrete paving, *Arundel Construction Co., 329 S. Caroline St., G. B. Beteler, Engr. of Highways Comm., City Hall.

Boston, Mass.—Mayor approved a contract with *F. J. Hannon, at \$2,280, for furnishing filling in Ralston St., from Dorchester Ave. to Old Colony Ave. Bids opened Dec. 22. Bidders: Bernard F. Hanrahan, \$5,320; Coleman Bros., \$6,840; Martino DeMatteo, \$9,044.

Painesville, O.—*Gottlieb Keener, Jr., Madison O., at \$2,920, for approximately 10,600 cu. yds. grading at approaches to Grand River bridge, let by Commissioners of Lake county, Albert David, Aud., C. N. Cummings, Engr., Painesville.

Beaumont, Tex.—For grading, scarifying and resurfacing the county road from the city limits to China, W. C. Byrd of Port Arthur proving to be the lowest bidder. He agrees to do the work at \$75 per mile, and a graduated scale of from 10 cts. to 50 cts. per ton for spreading the shell.

West Allis, Wis.—Street grading, including 50,000 yds. clay foundation. Bidders: Chas. Haworth, Milwaukee, 45 cts. excavation per cu. yd. Chas. Moritz, West Allis, 53 cts. excavation per cu. yd. E. G. Orbert, City Engr.

SEWERAGE

Joliet, Ill.—One of the problems of the future is the construction of a trunk-line sewer on the east side which will take the place of the inadequate slough drain.

St. Paul, Minn.—May build in 1917 relief sewer system, "Kittsondale" system; about 2 sq. miles long, sandstone tunnel and much trench work and pipe sewers; estimate \$285,000.

Chillicothe, Mo.—City engineer to prepare plans and specifications for new sewer district for the west end; will connect with Swift sewer south of town.

Erie, Pa.—The State Water Supply Commission has approved plans for construction of the \$850,000 Mill Creek tube here.

Charleston, W. Va.—City engineer prepares survey on the south side mill trunk sewer and paving of Watts St.

Dundas, Ont.—Ratepayers passed the sewer by-law. John S. Fry, Clerk.

Wallaceburg, Ont.—The sewerage by-law was carried. H. E. Johnson, Clerk.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Minneapolis, Minn.—Hennepin County Drainage Ditch No. 27, *Simon Gelle, Osceola, Minn., \$609; com. near French Lake; 5,708 cu. yds. excav. Co. Aud., Al. P. Erickson, Court House, Minneapolis.

York, Pa.—The city's contract for liquid chlorine to be used this year in the operation of the sanitary sewer disposal plant, by council, *Arnold Hoffman & Co., a Philadelphia firm, whose bid was 14½c. per pound. According to the estimate of Former Assistant Engineer J. K. Giesey, about 23,000 lbs. of chlorine will be used at the plant this year, entailing an expenditure of \$3,335. Other bid, of 15c. per pound, was submitted by the Electric Bleaching Gas Co., of New York City.

WATER SUPPLY.

Berkeley, Cal.—Mayor in his report plans improvements, establishment of a municipal collection of garbage, extension of the lighting system, to initiate steps for providing the city with a better water supply and modern equipment for its distribution. Consideration of plans for the improvement of the harbor front, construction of cisterns in the hillside districts and other parts of the city to provide for increased fire protection.

Canton, O.—City council will authorize the drafting of plans and the securing of a cost estimate for a reservoir to hold from 20,000,000 to 30,000,000 gals. of water.

Houston, Tex.—Extensive water system. The Council authorized the issue of \$75,000 bonds for building the South Side plant at Caroline St. and the north boundary to Hermann Park, and made an appropriation of \$40,000 from the general fund for the purchase of pipe for mains to connect the plant with the city system.

Lynchburg, Va.—City council adopts report on water, providing for improvements to the present Pedlar River water system, with James River water as an emergency supply. The plan as adopted follows: Install Venturi meter at Pedlar dam, \$2,000; install Venturi meter at Lynchburg, \$2,000; filter plant at the reservoir for the filtration of Pedlar River water and the filtration of James River water when used as an emergency supply, \$100,000; raise spillway of dam and install aerator at dam, \$18,000; aerator at College Hill reservoir, \$5,500; alterations to gravity pipe line, \$2,500; build new and separate main from 7th St. station to College Hill reservoir, \$25,000; build intervening sewer to eliminate local pollution from James River above point of intake, \$30,000; duplicate Pedlar River valley pipe line about three miles with cast iron pipe, \$100,000; piping from filters to Rivermount, \$15,000; total, \$300,000.

Richmond, Va.—Commissioners Henry P. Beck and Graham B. Hobson were appointed a committee to select two automobiles for the water department and one for the building department.

Seattle, Wash.—Plans of Consulting Engineer G. N. Miller, Burke Bldg., for a municipal light plant at Index, wash., have been approved by the city council there and the city attorney instructed to frame an ordinance authorizing an election to vote on a bond issue of \$20,000. The plant would develop 163 h.p. It was also recommended to purchase the water works system for \$10,000.

Oshkosh, Wis.—This city will be given the first opportunity to invest in the new \$85,000 issue of water works improvement and extension bonds, which was recently authorized by the commission council. It is expected that the bonds, which will be issued in denominations of \$1,000, \$500 and \$200, respectively, and bear interest of 4 per cent annually, will be ready for delivery about Feb. 1.

Amherst, N. S.—The town council contemplates the purchase of a motor driven centrifugal pump in connection with the water works system. Clerk, W. F. Donkin.

Gannanoque, Ont.—Improvements to the water works plant may be made shortly. Town clerk, S. McCammon.

Islington, Ont.—The township of Etobicoke proposes to construct a water works system, at an estimated cost of \$75,000, and will submit a by-law. The scheme includes the erection of a pumping station, the construction of a reservoir, trunk feeder and 7 miles of mains. Clerk, S. Barratt, Islington.

Dysart, Sask.—The village council will borrow \$1,000 for the purpose of providing a water supply for the village. Secretary, J. E. LaRoche.



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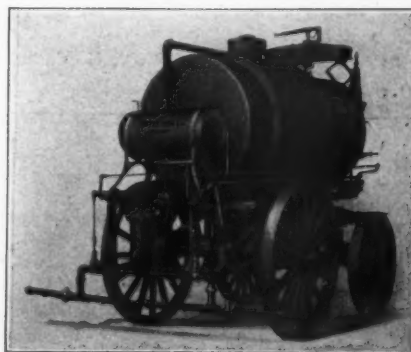
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BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

San Rafael, Cal.—*McLeran & Peterson, Sharon Bldg., San Francisco, Cal., at \$257,400, for constructing tunnel under Pine Mountain for Marin municipal water district.

Berwyn, Ill.—Engr. B. Strutzenberger, City Hall, Chas. Smith, pres. Bd. of Local Impts., City Hall, Let to *H. D. Hallett, 132 Drover Pl., Aurora, Ill. Water main (extension); \$17,000. Riverside and other streets.

Ft. Wayne, Ind.—Board of works: The Engineering Co.'s bid for \$22,251.25 was low for placing a roof over the reservoir. The other bids: Midland Engineering Co., \$25,686.62; John Hageman, \$24,350; Max Irmischer, \$25,311. Bids were taken under advisement.

Elmira, N. Y.—Water Board accepted a bid of \$1,050 submitted by *Archer & Baldwin, of 114 Liberty St., New York City, for the purchase of the old 300-

horsepower General Electric motor which will be displaced at the local pumping station in April when the new steam pumping unit is due to be delivered.

Sonyea, N. Y.—*C. A. Foote, Mt. Morris, at \$20,683, for improving water system.

Miami, Okla.—Water works (impr.): R. Q. James, City Clk.; 100,000-gal. tank and tower; *Chicago Bridge & Iron Works, Chicago.

Wetumka, Okla.—City to *N. S. Sherman Machine & Iron Works, 18-32 E. Main St., Oklahoma, for improving water and sewer systems, at about \$18,815.

Seattle, Wash.—34th Ave. W. et al., L. I. D., 3,042 water mains. Engr.'s estimate, \$57,521; *S. A. Mocerl, 1212 So. M St., Tacoma, \$66,660.55; Scalzo & Co., \$67,956; Florito Bros., \$68,284.40; F. N. Badolato, \$68,682.15; P. J. McHugh, \$69,161.25; L. Reccheo-D. Parisi, \$69,486.40; Superior Const. Co., \$69,855.95; City Contracting Co., \$69,825.50; G. Argentieri & Co., by check, \$71,576.75; Galluccio & Guida, \$74,627.55.

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